FOR
BETTER MANAGEMENT
OF
PLANT OPERATIONS

FACTORY

july 1961

PRICE ONE DOLLAR

A McGRAW-HILL PUBLICATION

PUBLIC
CONTROL OF
INDUSTRY
p. 61

PRODUCTION
GETS A
CRYSTAL BALL
p. 71

COVER STORY
PLANNED REPAIRS
SLASH DOWNTIME
p. 132

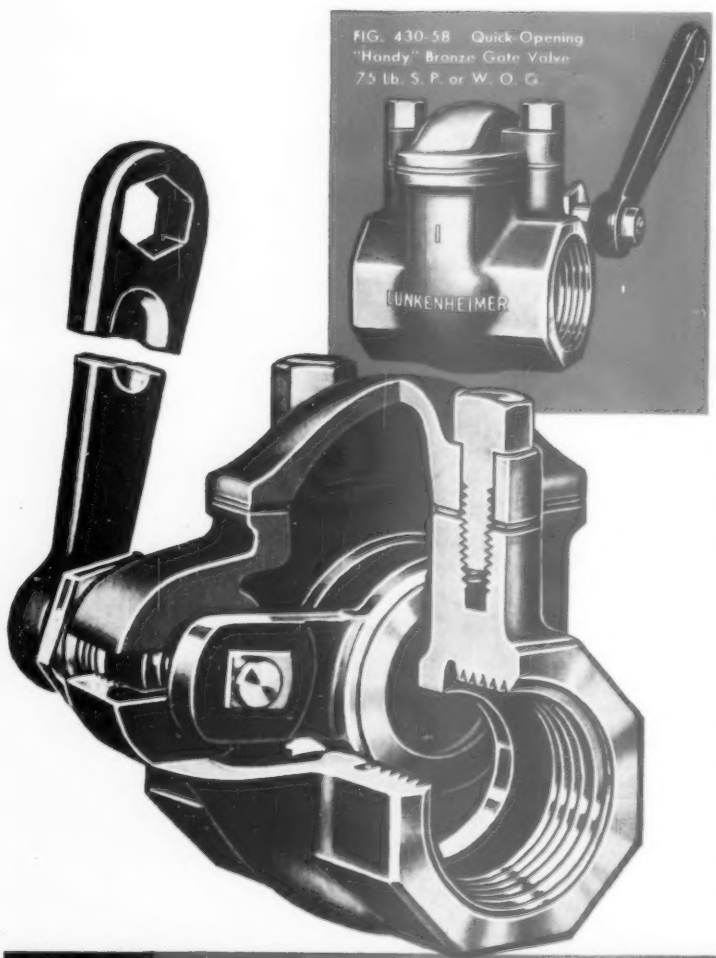
THE UNEMPLOYMENT PROBLEM

What can we do about it?
Cast your special ballot today on page 90A

NEW QUICK-OPENING BRONZE GATE VALVES

by LUNKENHEIMER

FOR TIGHTER SEATING...AT LOWER COST



Check these outstanding features and see why it pays to install Lunkenheimer Quick-Opening Gate Valves in <u>your</u> low-pressure system:

- Ball and socket joints between discs for tighter seating under pressure . . . easier operation . . . greater flexibility
- Self-adjusting discs for longer wear . . . tighter seating . . . lower maintenance
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- New, compact design to fit into "close" installations
- Easy-operating cap screws for faster assembly and disassembly

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THE ONE *Great* NAME IN VALVES

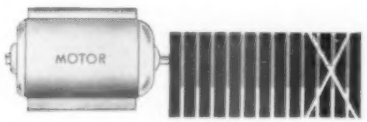
For more facts circle 404 on READER SERVICE CARD

B.F.Goodrich V belt briefs

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

BFG V belts have 40% greater horsepower rating, cost no more

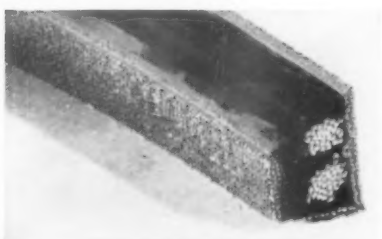
All B.F.Goodrich V belts now have 40% greater horsepower rating. This higher capacity rating was formerly found only in high capacity belts, but now costs *no more than former standard belts.* This means that lighter, more compact, and lower cost drives can now be used, because these B.F.Goodrich belts carry the horsepower needed for efficient drives using fewer belts at standard belt prices.



LOAD

9 V belts can now do work of 13.

What caused these failures?



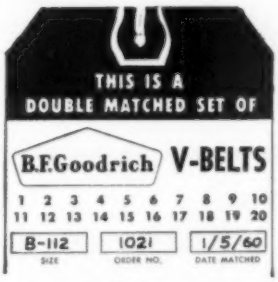
Answer: Prematurely worn sides are caused by grit, dirt or any such abrasive contact. Misalignment often causes wear on one side only. To prevent, align the sheaves, checking with straightedge or cord. Keep belts and sheave grooves clean.

Answer: Belt put on improperly, or foreign objects fell into groove to rupture cover fabric. To prevent, move motor toward driven sheave when replacing belt. If rupture was caused by foreign object, protect belts with a cover.

BFG double matching program keeps V belts matched during the life of the drive

Double-matching assures you that a set of B.F.Goodrich V belts are of equal length when installed and will stay uniform in length for the life of the belts. When V belts of different lengths are put on the same drive, longer belts loaf, while shorter ones carry all the load and fail quickly. B.F.Goodrich double-matched belts are measured *twice* for uniform length, once when manufactured and again after storage. Only belts that are of equal length when manufactured and after storage are grouped into sets.

Belts that are grouped into sets are tied together with a tag which gives the date when belts were matched. Belts which have been in storage over a year and "tag ends" are returned to BFG for replacement to make sure that your distributor always has a fresh stock of double-matched belts.



Here's the tag which goes on each set of double-matched belts, giving exact date belts were matched.

How to protect against static electricity in V belt drive

Static electricity is developed on every V belt drive. If there is an explosive atmosphere under certain conditions it can trigger an explosion.

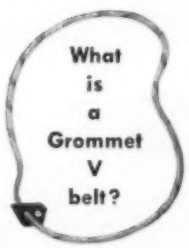
Various means are used to get rid of this static charge. The most reliable method is in the use of static conducting V belts which are grounded to both the motor and the driven unit.

But unless the motor and the driven unit are properly grounded there can be no protection regardless of the type of static conducting V belt used.

Static conductivity in a V belt is made possible by special compounds used in the cover. Because cover wear reduces the belts' ability to conduct static, drives should be inspected frequently. Any belts showing cover wear should be replaced immediately. With any set of V belts, it is good practice to replace the entire set.

When ordering BFG Multi V belts, "static conducting" belts must be specified and cost slightly more. All BFG Maxipower V belts are static conducting and heat and oil-resistant at no extra cost.

The Question Corner—



Grommet construction is exclusive in B.F.Goodrich V belts. Grommets are two extra strong cord loops, inside the belts, like twisted cables, except they are endless. Unlike ordinary belts, there are no center cords in the Grommet belt, so it is more flexible, can "give" temporarily and absorb shock loads.

Let your B.F.Goodrich distributor show you how this higher capacity, longer belt life, ability to stand hard use, can reduce your V belt costs per year and make other savings in operating and maintenance costs.

Ask a factory-trained specialist

For help in selecting V belts for any kind of service, call the man who is a specialist in V belts—your B.F.Goodrich distributor. He can help you cut costs by getting longer life from your V belt drives. *B.F.Goodrich Industrial Products Company, Dept. M-111, Akron 18, Ohio.*

FOR BETTER
- PLANT MAINTENANCE & ENGINEERING
- PRODUCTION
- PLANT MANAGEMENT

JULY 1961

FACTORY

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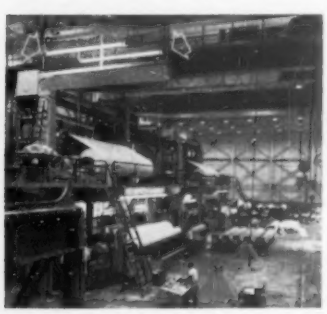

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COMING

In August see how Western Electric revitalized a 50-year-old plant and turned it into a modern production miracle. This multi-storied brick building now handles a smooth-flowing, straight-lined process. If you're thinking of modernization, you'll find plenty of tips here. **In coming months** we'll give you an intriguing look at your counterpart in Mexico. How do a Mexican manager's problems compare to yours?

COVER

Discussing maintenance job progress at Union Carbide's Texas City plant are (left to right) Operating Area Superintendent D. C. Burger, Planning Head A. M. Robinson, and Maintenance Superintendent H. E. Padgett.

70TH YEAR OF PUBLICATION

JULY 1961 Vol. 119 No. 7

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Turn the page for FACTORY's Problem-Solving Guide

PROBLEM-SOLVING GUIDE

Ideas to cut 'n' keep

THIS FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve your current operating problems. Here's how it works:

1. All major articles (set here in bold type) and many short items are classified according to a functional code. Codes cover basic operating responsibilities.

2. Certain articles are also coded (see numbers in parentheses) to show secondary or closely related topics.

3. To use, cut up the items below. Paste them on 3x5-in. cards, file by code number. To cross-index, copy information on a second card, file by secondary code.

For ways to use your Guide, write Reader Service, FACTORY, 330 W. 42nd St., New York 36.

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● *There are more than 400 Rollway Distributors, located to serve you at a moment's notice. Ask your nearest one for a complete product line bulletin or write the company direct. Rollway Bearing Company, Inc., Syracuse, N. Y.*

When down-time costs pile up as a result of bearing failure, bearings become the most important component on the line.

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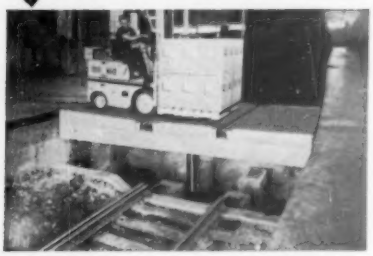
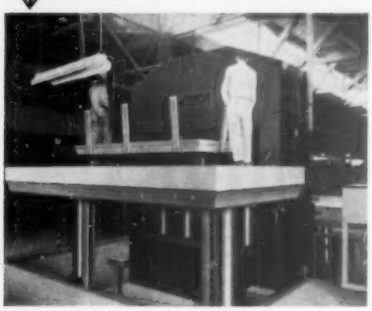
SPAN A TRACK
to speed plant traffic



LOWER A TRUCK
for faster loading and unloading

FEED A MACHINE
with greater economy and efficiency



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ROTARY LIFT COMPANY
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LETTERS

Surprises in FACTORY's survey data

Dear Sir:

Your presentation of the APICS-FACTORY survey of production and inventory control practices (FACTORY, April 1961, page 80) was excellent. Some of your statements really startled me. After checking them with the tabulated data, however, I found your conclusions were reasonable. The manner in which they were stated may help to awaken management to the need for attention to these functions.

Donald F. Hess
Executive Vice President
American Production and Inventory Control Society
Chicago

Axe wielding raises readers' hackles

Dear Sir:

"Management Wields the Axe" (FACTORY, April 1961, page 64) led to my discovering that FACTORY is more widely read in American Optical than I realized. My associates generally felt the article had a pessimistic note out of keeping with FACTORY's usual constructive approach. But if your intention was to start provocative thinking and discussion, the article was very successful.

Ralph H. Stearns
Manager, Industrial Engineering
American Optical Co., Southbridge, Mass.

Correct name of walkie truck maker

Dear Reader:

Page 122 of the June issue of FACTORY is the second page of the article "What You Should Know about Walkie Trucks." On this page there is an unintentional but very confusing mistake in the name of one of the manufacturers of walkie trucks.

The first manufacturer listed is "Automotive Transportation Company." The correct name of this firm is "Automatic Transportation Company." The address given, 101 W. 87th St., Chicago 20, is correct. Then, under "Catalogs," we again misnamed the company "Automation Transportation Corporation." This also should have read "Automatic Transportation Company."

Editor

Electric vs. gas-powered trucks

Dear Sir:

We are trying to appraise the differences between our battery-powered and LPG-powered industrial trucks. Incidentally, our experience with LPG-powered trucks has been good. We have found them as safe as electric trucks, and we like factors such as

Nibroc® *towels hold up while they soak up*

Everything is a big word, but Nibroc Towels have it! Nibroc Multi-fold towels are soft and lint-free — women like them, men appreciate them. And they're strong — one towel does the job with ease and economy. Balanced Quality makes the difference. The *speed* of absorption and absorption *capacity* are perfectly balanced. *It holds up while it soaks up!* Why be satisfied with less?

Choose from a complete line of Nibroc Quality towels . . . multi-fold, single fold or C-fold, in natural or the super white embossed line — packed in convenient Zip-Top cartons. See how Balanced Quality reduces towel cost. Write Dept. F7, Boston for samples . . . or contact your nearest distributor.

Another Quality Product of

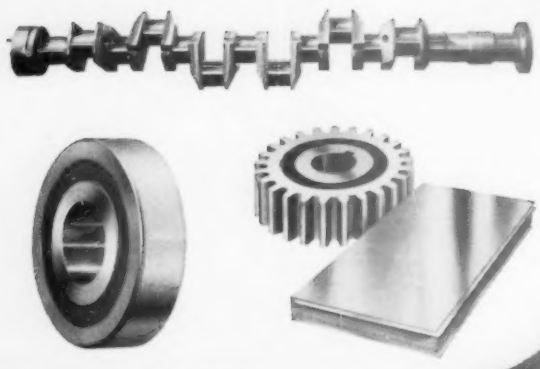
BROWN COMPANY

General Sales Offices:
150 Causeway Street, Boston 14, Mass.

Balanced Quality

For more facts Circle 409 on Reader Service Card

VALVOLINE
Tectyl
protects metals
against RUST



There's a job for Valvoline Tectyl in your industry, protecting metal surfaces against rust and corrosion during shipping and storage.

Low-cost Tectyl rust preventives are widely used by the military services and by industry.

Tectyl's easy-to-apply, easy-to-remove film provides complete protection from the effects of snow, rain, salt air, humidity, perspiration and corrosive fumes.

Tectyl rust preventives meet exacting government specifications and there are more than 40 variations to meet every industrial need. *We suggest you write today for your copies of two helpful, detailed Tectyl charts which give industrial and government specifications and applications.*

VALVOLINE
Tectyl
RUST PREVENTIVES

VALVOLINE OIL COMPANY, Division of Ashland Oil & Refining Company
Refinery — Freedom, Pennsylvania — Home Office — Ashland, Kentucky

Begins on page 6

LETTERS

their faster forward and lift speeds, plus sustained power and maneuverability.

Please send me copies of articles that would help us make a comparison.

Thomas R. Peirce
Dept. of Engineering
Western Printing and Lithographing Co.
Poughkeepsie, N. Y.

►Sorry, we're out of copies of "Picking Your Best Truck Fuels" (FACTORY, June 1957, page 126). See page 122 of the June 1961 issue for a listing of sources of information on industrial trucks.—ED.

Overhead cost?

Dear Sir:

From the many surveys you have conducted have you developed data on overhead percentages used to establish cost center charging rates? We'd like to compare our rates with others in metalworking plants.

W. A. Hagen
Planning and Control
Brown Engineering Co., Inc.
Huntsville, Ala.

►"Manpower Yardsticks" (FACTORY, Sept. 1957, page 109) is the nearest we can come to this request. It shows the distribution of all employees in 226 companies surveyed. Perhaps other readers would like to compare notes directly with Mr. Hagen.—ED.

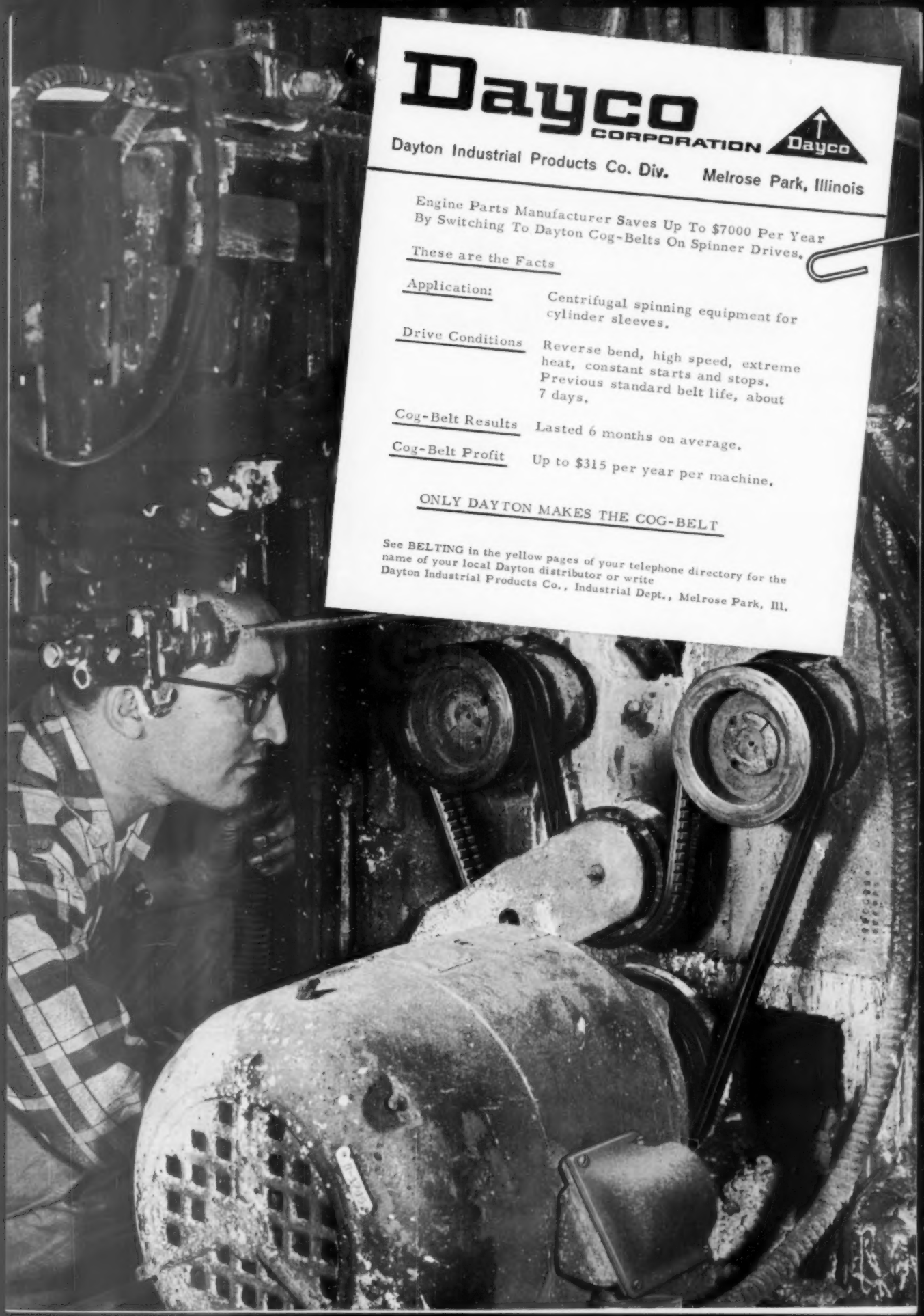
Spotlight on housekeeping

Dear Sir:

The Editor's answer to a letter in FACTORY's May issue said you were sending the reader a bibliography of

FACTORY welcomes opinions and suggestions from its readers. They help us put management problems in better perspective. Letters should be addressed: The Editor, FACTORY, 330 West 42nd St., New York 36.

For more facts Circle 410 on Reader Service Card Circle 411 on Reader Service Card for items on next page



Dayco

CORPORATION

Dayton Industrial Products Co. Div. Melrose Park, Illinois

Engine Parts Manufacturer Saves Up To $7000 Per Year By Switching To Dayton Cog-Belts On Spinner Drives.

These are the Facts

Application:	Centrifugal spinning equipment for cylinder sleeves.
Drive Conditions	Reverse bend, high speed, extreme heat, constant starts and stops. Previous standard belt life, about 7 days.
Cog-Belt Results	Lasted 6 months on average.
Cog-Belt Profit	Up to $315 per year per machine.

ONLY DAYTON MAKES THE COG-BELT

See BELTING in the yellow pages of your telephone directory for the name of your local Dayton distributor or write Dayton Industrial Products Co., Industrial Dept., Melrose Park, Ill.

extra! extra! extra!

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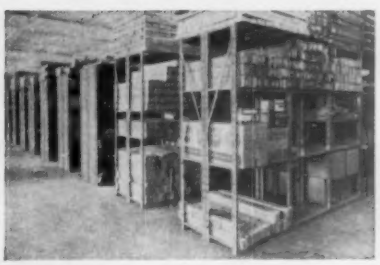

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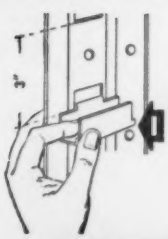

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Begins on page 6

LETTERS

37 FACTORY articles on maintenance work measurement. And, in answer to another letter, you sent copies of two articles on cost reduction in janitorial work.

Please send me copies of both sets of information.

C. A. Lord
Industrial Engineer
The Givaudan Corp.
Delawanna, N. J.

Dear Sir:

I noted in the Letters Department of your May issue that you offered copies of two articles to a reader who wanted information on reduction of janitorial costs. May I have copies of the same articles?

Frank Stainko
Industrial Eng. Manager
Montgomery Ward
Kansas City, Mo.

►**We're pleased to send copies of FACTORY articles to those who ask, as long as the supply lasts.—ED.**

FACTORY

July 1961 Vol. 119, No. 7

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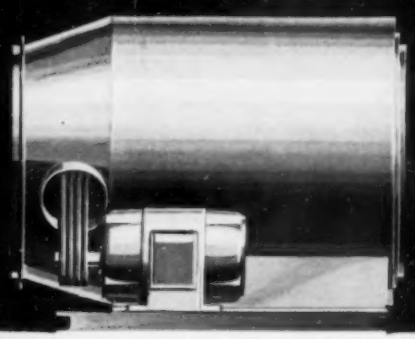

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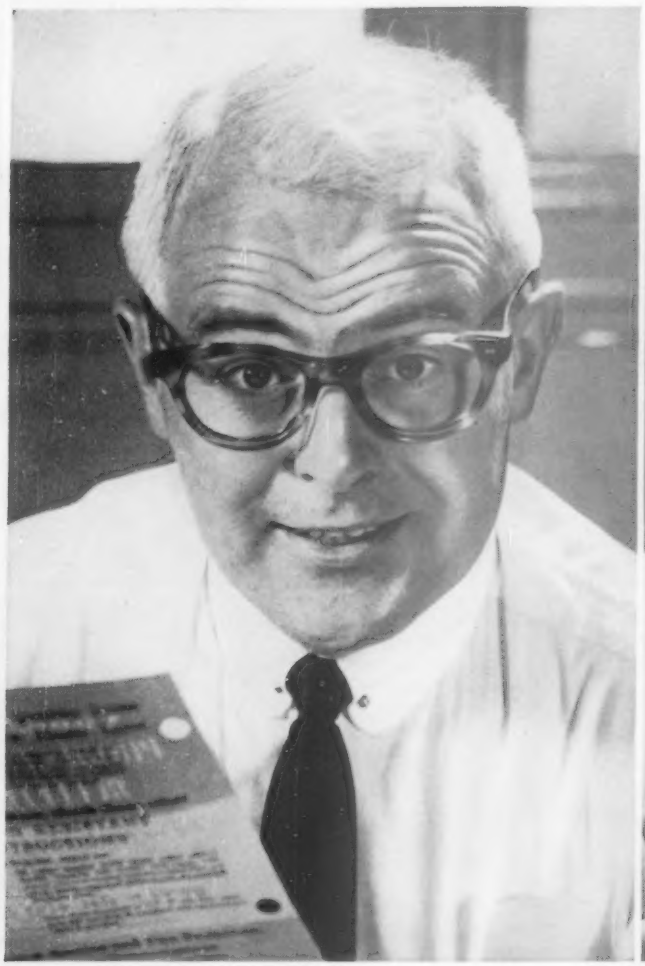

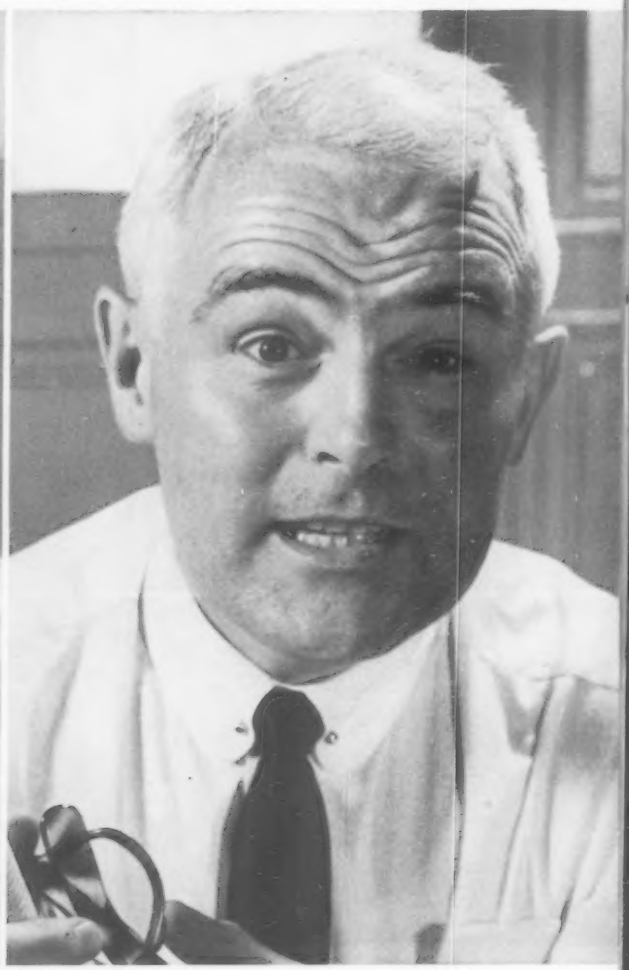

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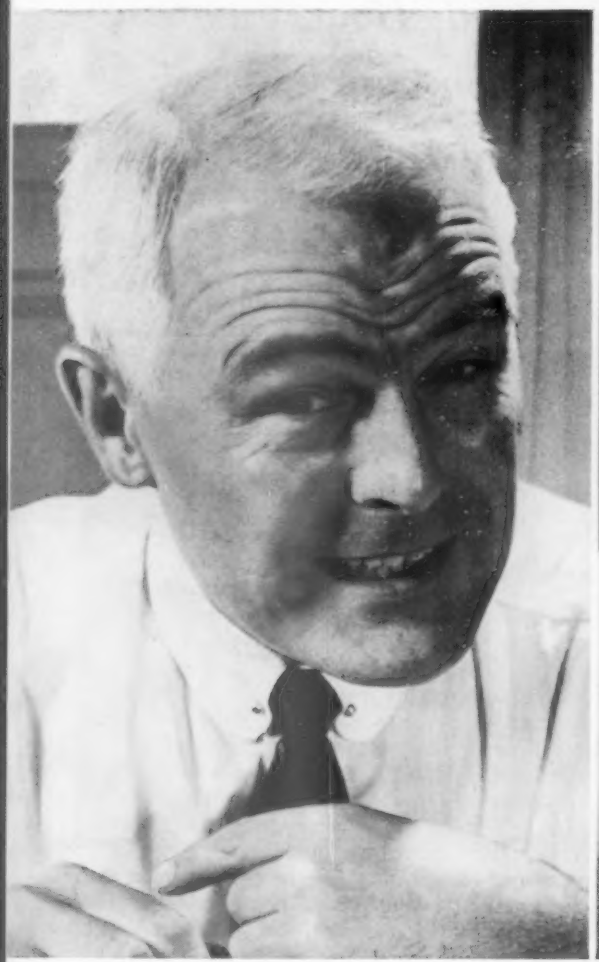

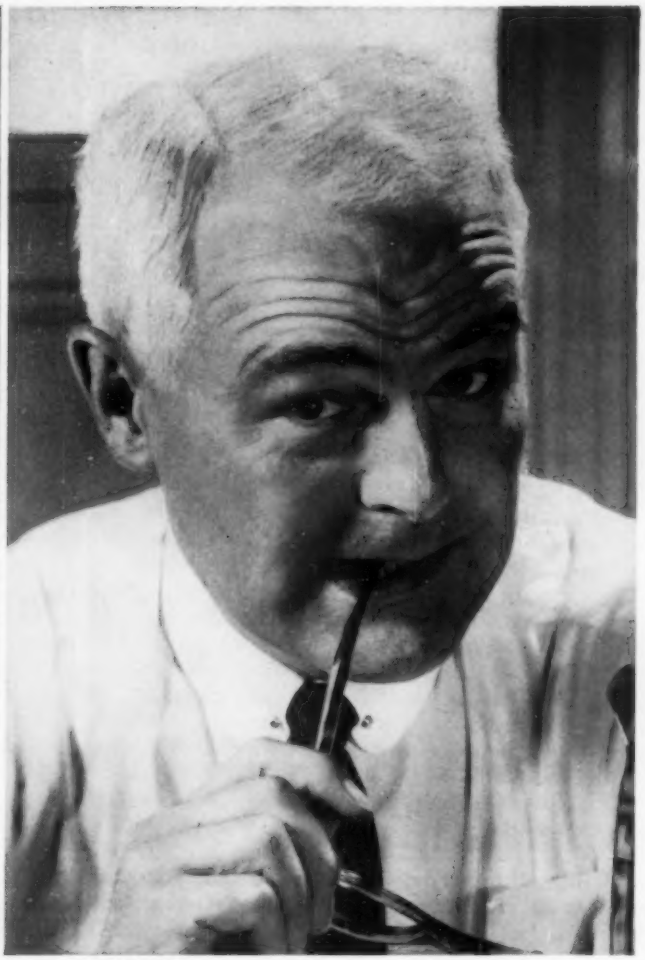

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Could this strike have been avoided? How? Compare your solution with that of labor expert . . .

George Odiorne

This bright young man tried to parlay his forceful manner and a borrowed idea into short-term gains for his slow-moving company. With better-laid plans, he might have achieved his goal.

George Cartright was an alert, aggressive manager. He had chalked up a fine record as a salesman and sales supervisor before he was made service superintendent in a Southern chemical plant. In this job he headed up accounting, medical department, office services, personnel—and labor relations. As a young-man-in-a-hurry he was tagged by top management as a fellow with a good future. For one thing, he was aggressive in a company that had let itself become a follower. As the executive vice president said to George when he was transferred to the plant:

"We're not taking you out of sales because you weren't a success there. On the contrary, we're putting you in the plant because you've proven yourself. We think this will round out your experience and help your career a lot. There's another reason too, George, and that's the fact that many of our plant people aren't quite forceful enough as administrators. They're excellent engineers and chemists, but not very aggressive as managers. Their laxity is bad for the business. As service superintendent, you'll have to depend on your subordinates in the key spots for a while. But as we see it, your basic strength is your willingness to make decisions, and we expect you to move in and add some real zip to that plant."

George was a tremendous worker, and tied into the plant job with a drive and energy that spurred the whole organization into more life than it had shown in a long time.

After a short while, the labor relations manager—a dried-up little fellow named Lefty, who had been in labor relations for many years—briefed George on the forthcoming negotiations. The three-year contract was due to expire in two months and Lefty was looking for some guidance on what he should plan on using for bargaining. And he had had his ear to the ground on what the union would probably ask for.

"From what I hear, they are going to ask for the moon, but, as usual, they will settle for the industry pattern—what the big outfits are giving. It amounts to 8 cents an hour no matter how you slice it."

George talked this over with the general manager and the cost accountant. They realized that the added cost could not be wholly passed on to the customers because of foreign competition. So if the union got the full 8 cents, it might cause a pinch on profits.

The accountant was even gloomier. "With the way some other things are going up, I don't think this plant will make a penny next year if we give 8 cents."

George thought this over, and then went to the chief engineer and asked him if he could suggest any equipment changes that would cut costs enough to offset the 8-cent raise. The engineer was optimistic.

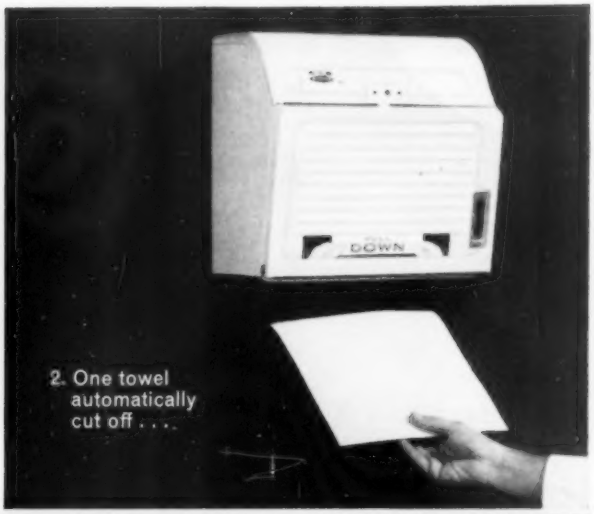
"As a matter of fact, there are several things in the works right now that would make it easy for us to give the 8 cents and still hold our own. But we'd have to get the union to agree to our reshuffling some job duties to take advantage of the new stuff."

Encouraged, George talked further with the general manager, who said, "Listen, if you can get those changes in job specs from the union, we should be able to give them the 8 cents. Of course, if you can settle for less, do it, but if it comes down to a strike or paying 8 cents, then pay the 8 cents.

That night George went to a monthly meeting of the executive club. The speaker—a labor manager from a large electric company—was talking on "bargaining strategy." He described an interesting labor relations policy that had worked at his firm: The company figured out what it could pay, made a firm offer, and didn't back down. "We don't believe in this business of taking a position we don't intend to keep, and then bargaining downward. That kind of haggling is foolish. We name our price and that's it."

The speech made a great impression upon George, and he could hardly sleep that night as he thought about its impact on the negotiations that were coming up.

Turn the page



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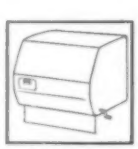

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ON STRIKE . . . *Begins on page 14*

First thing next morning, he called Lefty in and laid out the proposal for the bargaining sessions. "We'll offer five cents, and not budge from it. We'll take a strike if we have to," he told Lefty.

Lefty was unusually dour as the conversation ended.

"I dunno if you're going to get away with it," he said. "The boys in the local aren't exactly stupid, and they know the pattern in chemicals has been 8 cents. Maybe we ought to go through the usual song and dance, then settle for 8 cents, provided they go along with the engineering changes. I hear they won't fight us too hard on that. This way both sides make out."

George almost wavered, but he remembered what he'd been told when he was reassigned. He was here to make decisions. And he'd make them.

"To hell with that noise. We're gonna give 'em a nickel an hour, and get the engineering changes *too*."

Negotiations caved in the second day when George slapped his nickel offer on the table, and made it clear that the company wouldn't back down. Two days later the plant gate was surrounded by pickets. After 12 weeks George was sent back into sales. A negotiator from company headquarters came in, and the company settled for 8 cents with an agreement that the union would cooperate on the engineering changes.

Now George Odiorne tells how this strike could have been avoided

George was a strong man, and had a lot of good qualities. In sales, or even some management positions, he was a sure bet to forge ahead and get results. But he made two mistakes:

1. He used truculence and toughness in a situation where he was bucking the tide of long-accepted patterns. This might have worked if he had given the new idea time to catch on. This plant had been following a lax pattern for years, so George's charge was uphill, against loaded guns. He might have succeeded if he'd tried to move his contract dates up *ahead of the others*. He could then have set the pace for the industry, leading the more timorous fellows, rather than trying to stop the mob once it was in full cry. But because his company's contract *followed the others*, he was in no position to change the industry pattern.

2. From a standing start, he tried to copy another company that had spent years building a climate that made the "firm line" a viable way of bargaining. When copying another company in labor relations, an after-dinner speech isn't enough evidence or information upon which to base company policy. Timing is important, and should be backed by careful and soundly planned strategy. From the company viewpoint, George was reckless with their assets—not because his goals were wrong, but because he tried to move too fast. If he had mapped out a two- or three-year plan to get into position to use the idea, he might have succeeded.

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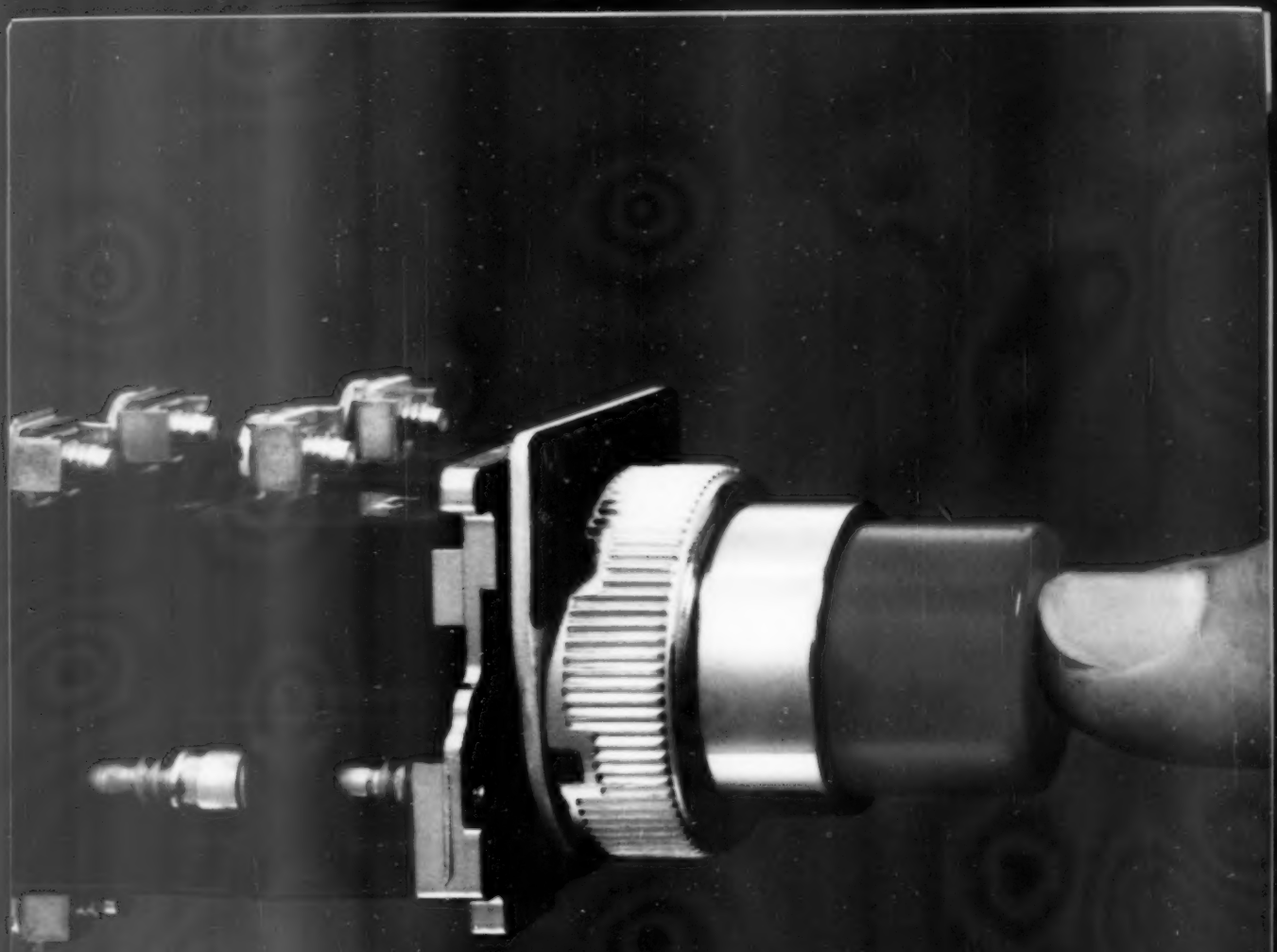

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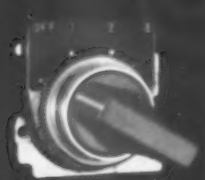

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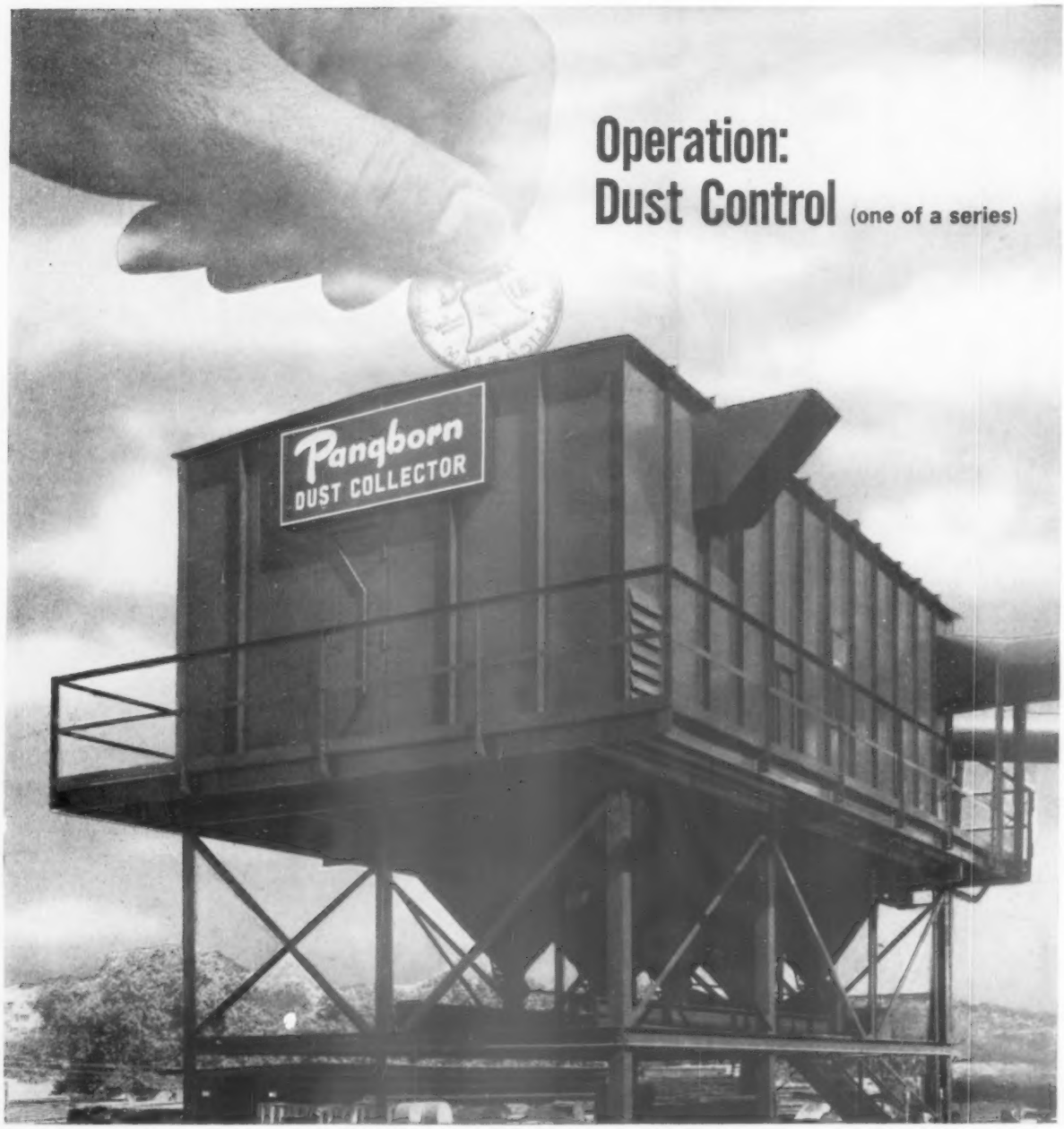

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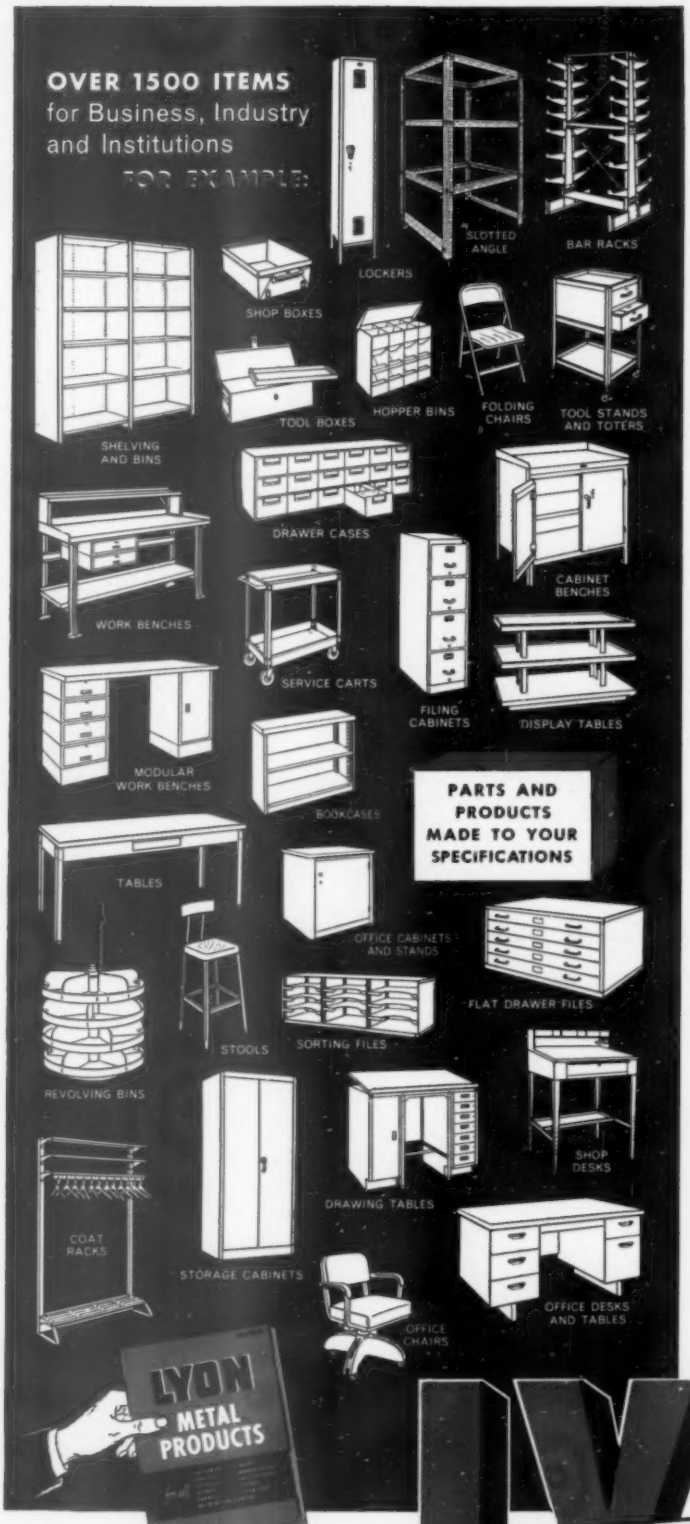

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5 TO 1

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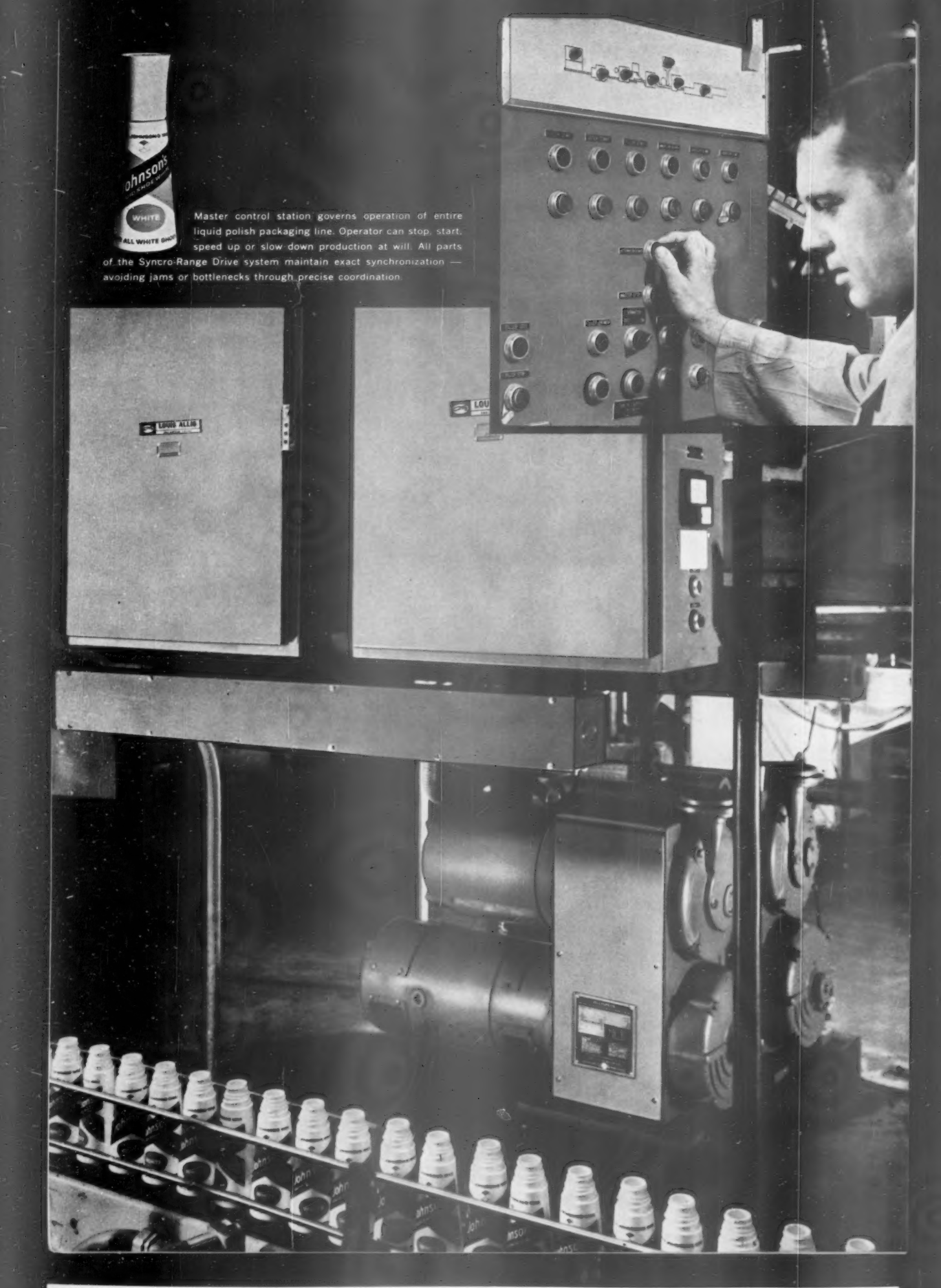
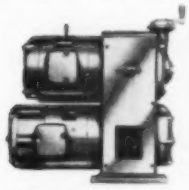


Master control station governs operation of entire liquid polish packaging line. Operator can stop, start, speed up or slow down production at will. All parts of the Syncro-Range Drive system maintain exact synchronization — avoiding jams or bottlenecks through precise coordination.

The key components of the Syncro-Range Drive...



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Syncro-Range Drives provide synchronized speed of any number of motors from a single control. It is a "packaged system" comprising an adjustable-frequency power supply operating on 3 phase, 60 cycle power input . . . a group of Syncro-Spede® synchronous motors which maintain exact synchronism regardless of varying load . . . and a control which permits the speed of the entire group of motors to be simply adjusted without losing synchronization. On applications for which exact synchronism is not required, standard squirrel-cage motors can be supplied.

You can readily see the advantages of the Syncro-Range Drive in systems or processes which require synchronized movement: multiple conveyors which feed consecutively; transfer lines; process lines; assembly lines requiring coordinated arrival of components; printing where one press feeds another; synthetic fibre spinning, drawing, or twisting; metal runout tables; and many other similar continuous-process machines which require the application of power at a number of points on the machine.

The Syncro-Range Drive is available with a choice of drive sizes to efficiently control from 2 to 200 (or more!) standard or Syncro-Spede motors of the same or different horsepower ratings. The Syncro-Spede motor is an A-C synchronous induction motor without slip rings or D-C excitation. It requires no more upkeep than a standard, squirrel-cage motor and can be supplied in open drip-proof, enclosed, or explosion-proof enclosures with mechanical modifications to match your requirements.

A sophisticated selection of control features are available in the system, including motor starters, main line circuit breaker or fusible disconnect switch, speed adjustment, speed indicator, remote control, and automatic control governed by temperature, pressure, or flow sensing devices. Controls can provide speed regulation accurate to 0.1% with 0% relative speed difference between motors!

Investigate the application of the Syncro-Range Drive system to *your* process. A trained Louis Allis motor application engineer is always available. You can reach him at your local Louis Allis District Office, or by writing direct to The Louis Allis Company, 432 East Stewart Street, Milwaukee 1, Wisconsin.

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

LOUIS ALLIS

A19-231

For more facts Circle 421 on Reader Service Card

ALEMITE
BARREL-TO-BEARING
LUBRICATION

the "moving force" of production!

More and more, cost-conscious plant men are recognizing modern lubrication as an important "production tool." No longer do they see it as a simple maintenance problem.

With the years-ahead Alemite Barrel-to-Bearing Lubrication method, today's leading manufacturers are stepping up production . . . reducing downtime . . . extending machine life.

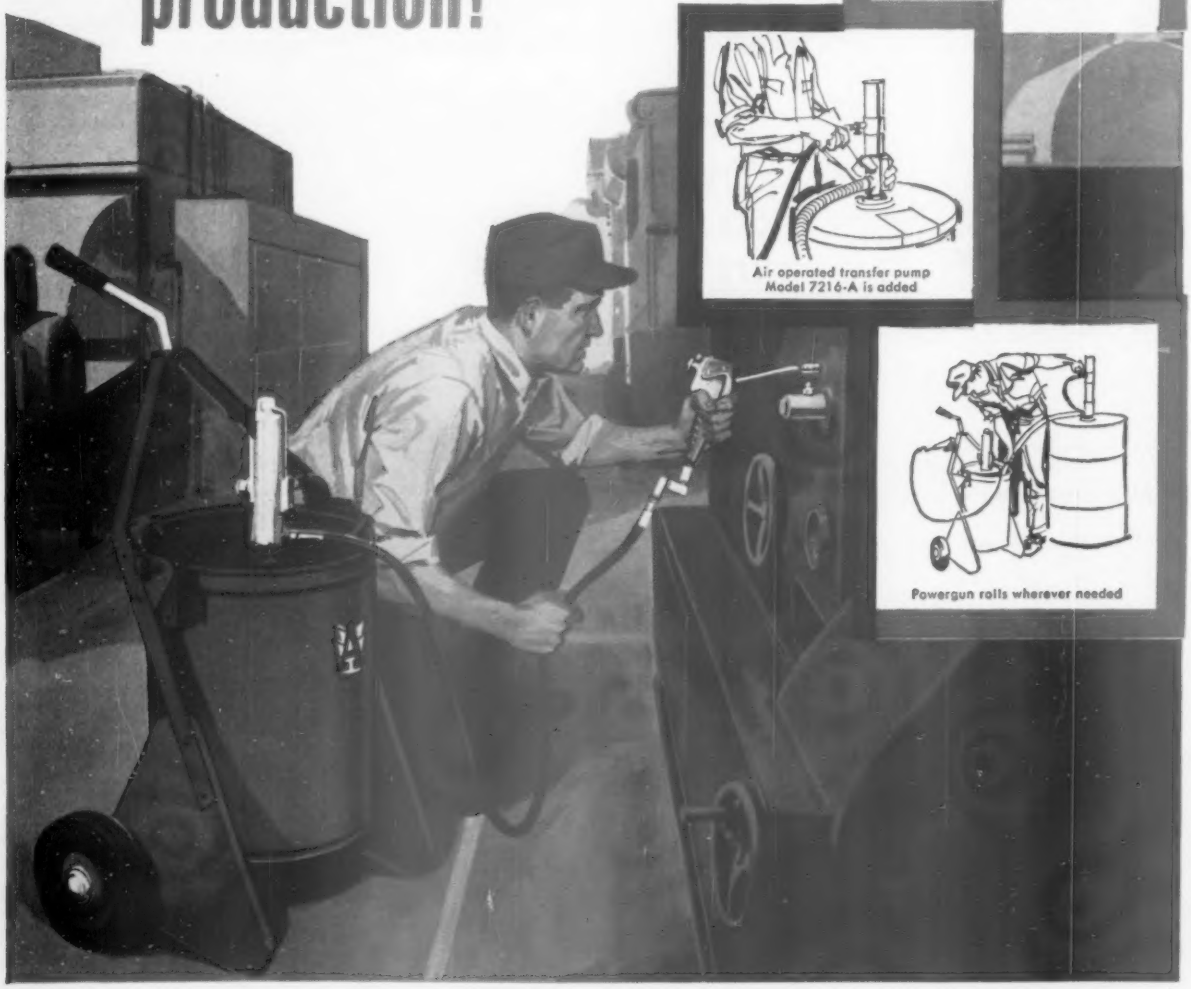
Included in a complete Alemite barrel-to-bearing lubrication method can be electric, air or hand-operated equipment. It will more than meet every need for high-pressure lubrication, filling hydraulic systems, servicing oil reservoirs, lubricating gear housings, and refilling grease guns.

Write for free Alemite catalog today!

Symbol of SW Excellence

ALEMITE
DIVISION
STEWART-WARNER
CORPORATION

Dept. B-71, 1850 Diversey Parkway, Chicago 14, Ill.



Cover protects 400 lb. drum

Air operated transfer pump Model 7216-A is added

Powergun rolls wherever needed

For more facts Circle 422 on Reader Service Card

Materials handling for only pennies a day!

AUTOMATIC® *Transporters do many jobs, cost surprisingly little*

Here's the economical way to put mechanical handling to work for you in cramped quarters or where distances are short. AUTOMATIC Transporters with finger-tip controls speed up operations and cut handling costs. You get these advantages at an initial cost far less than rider-type trucks. Operating costs are lower, too. Just pennies a day buys the power for these rugged machines. With over 75 different walkie models in the AUTOMATIC line, there's a Transporter to fit every job.

Cantilever-type Transporter-Stacker with remote control mast and special platform expedites selection of orders. Truck also can be used for conventional stacking. Model WST capacities 1,000 through 4,000 lbs.

Model WAT Transporter stacks pallets in narrow aisles. Load is carried on forks between outrigger arms which provide safe stability during stacking operations. Capacities from 2,000 through 20,000 lbs.

AUTOMATIC

AUTOMATIC TRANSPORTATION COMPANY
Division of The Yale & Towne Manufacturing Company
39 West 87th Street, Dept. K1, Chicago 20, Ill.

FIRST IN IMAGINATION
FIRST WITH REALITY

—SEND FOR DESCRIPTIVE LITERATURE—

Get all the facts about AUTOMATIC's 75 Walkie models. Write for "Transporter Facts and Factors" booklet and "AUTOMATIC Industrial Trucks Selector Guide."

Name_____

Company_____

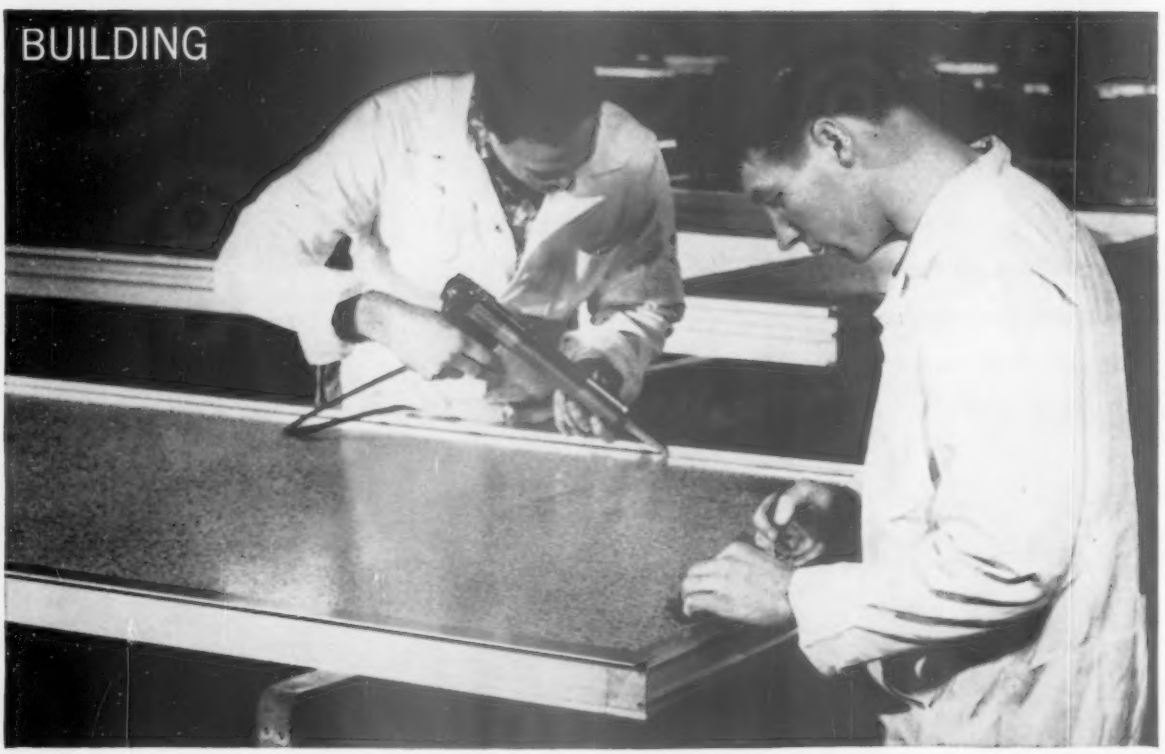
Street_____

City_____ Zone_____ State_____

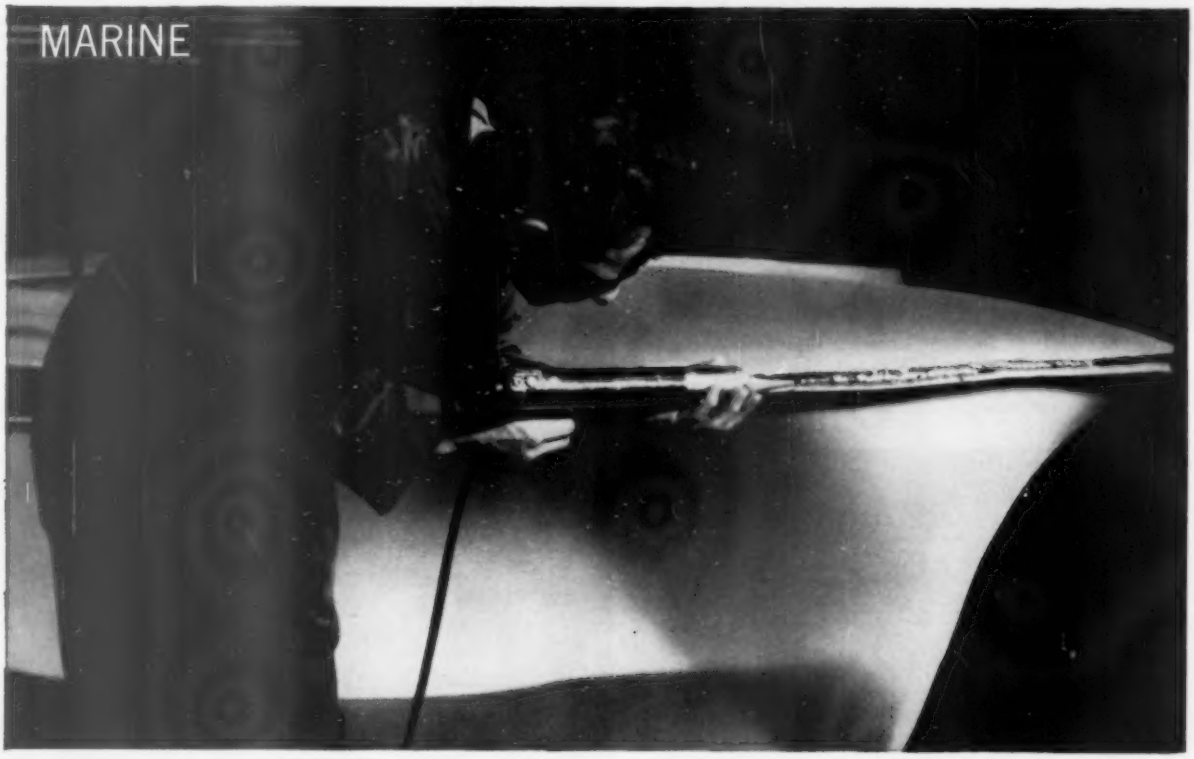
For more facts Circle 423 on Reader Service Card

PRODUCTION'S BIG PLUS

POLYSULFIDE-BASE SEALANT SPEEDS ASSEMBLY



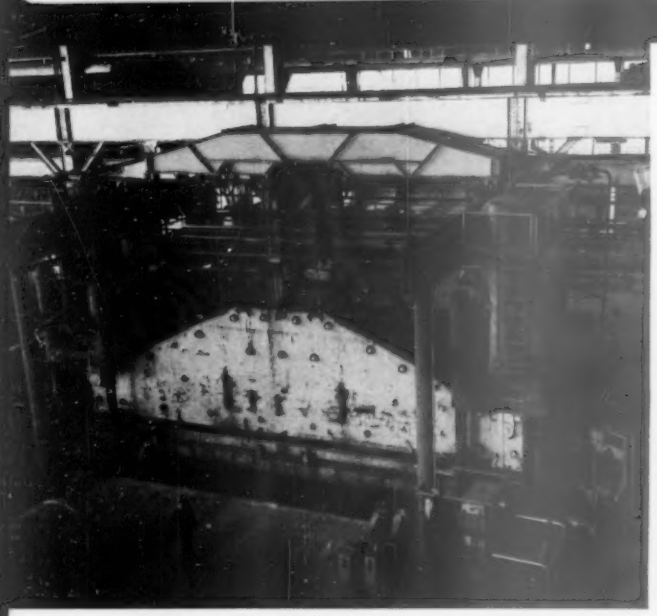
IN THE BIG INDUSTRIES
LINE PROCESSES, IMPROVES END PRODUCTS!



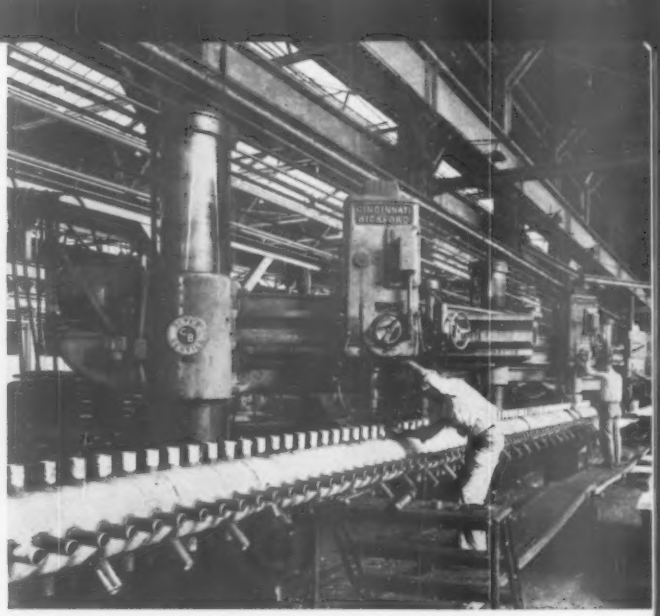
Compound with THIOKOL polysulfide polymer is being used in more and more products – as a sealant and adhesive – to seal joints and seams, to weatherproof, and to reduce or supplement mechanical fastening. ■ Leading trailer makers install it to bond roof to cross members, to seal floor joints and skylights. Top boat builders caulk decks and hulls with this material to produce pleasure craft that are lastingly watertight. Building components manufacturers weather-seal pre-fab curtain wall panels. The aircraft industry depends on it to seal integral wing fuel tanks. ■ THIOKOL polysulfide polymer is synthetic rubber in liquid form which air-cures to a flexible, cushiony solid. It adheres with weld-like strength to all kinds of materials – wood, metal, plastic, glass... resists oil, moisture, aging, gases, and thermal change... provides long life and trouble-free service. ■ A little imagination plus compounds with THIOKOL polysulfide polymer may improve your product, speed production, cut costs. It has for many industries. Full story? Write for Brochure IA-200.

Thiokol®
CHEMICAL CORPORATION
780 N. Clinton Ave., Trenton 7, N. J.
In Canada: Naugatuck Chemicals Division, Dominion Rubber Company, Elmira, Ontario

For more facts Circle 424 on Reader Service Card

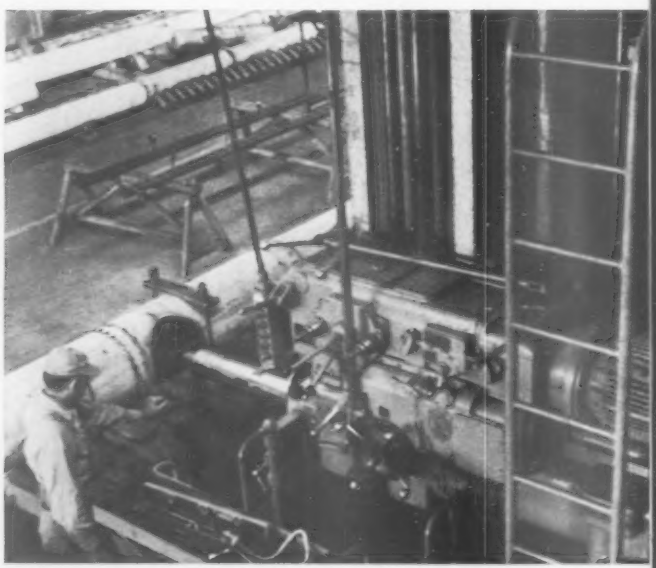


Overhead view of 2500-ton press. It forms heavy steel plate for drum shells—up to 7 inches thick, up to 30 feet long. Gulf Harmony 61 is used in the hydraulic system.



Cincinnati Bickford radial drill presses — working on headers. Gulf Harmony 61 is used in column mechanism, drill-head mechanism and main drive gear boxes. Gulf Precision Grease is applied to fittings.

Colburn Vertical Boring Mill—milling a drum head. Gulf Harmony 61 is used in the circulating system for main drive gears; in the reservoir for feed change gears.



Giddings & Lewis 6" horizontal boring machine—boring hole in header. Gulf Harmony lubricates the column slides and screws on this new machine.

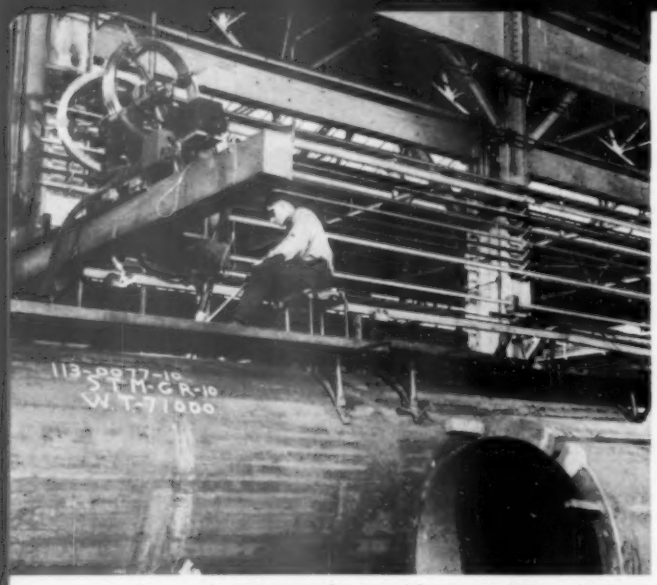
Simplified lube program helps Babcock 16 lubricants to just 7...

The Paris, Texas, plant of Babcock & Wilcox specializes in the manufacture of steam generating equipment. Typical examples: 65-ton boiler drums and 4-ton tube sections.

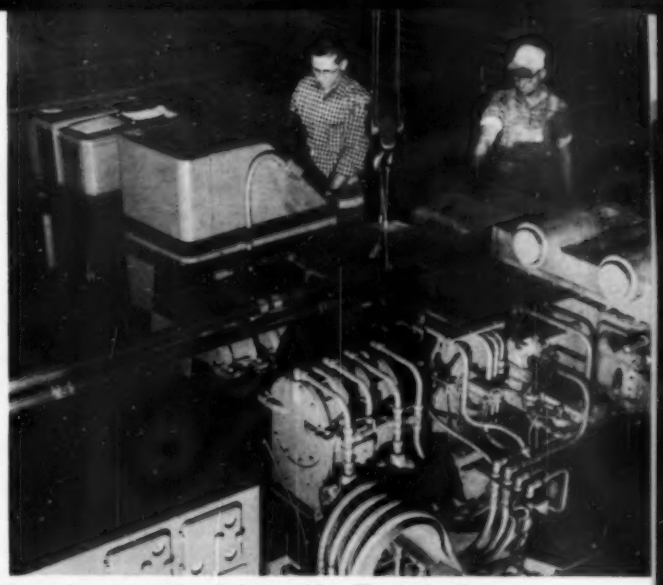
Recently, Gulf Sales Engineers conducted a lubricant survey in this plant. As a result, lubes were reduced from 16 to 7. This reduced the possibility of application errors and simplified ordering, bookkeeping and handling.

"It's important to keep lube recommendations up to date," says C. C. Eagon, Master Mechanic. "We call in lubrication engineers as new machines arrive. And they help us translate the manufacturer's lube recommendations in terms of their oils and greases."

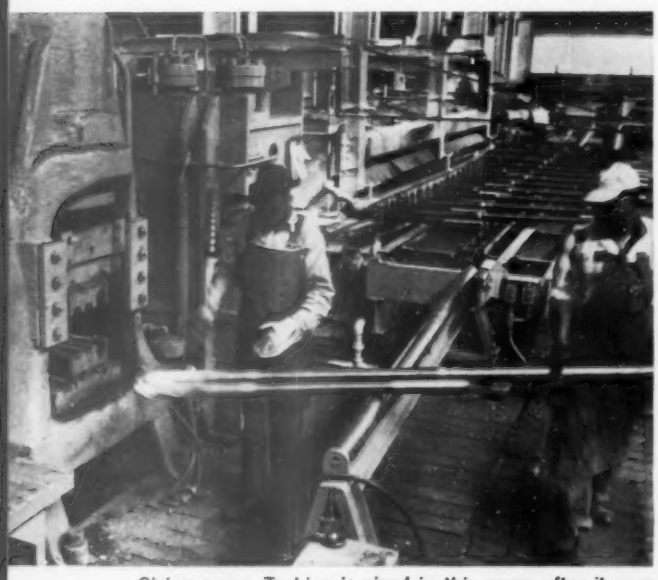
The seven recommended grades are really four basic types of Gulf oils and greases. First, Gulf Harmony® oils—highly stable lubricating oils with excellent water separating properties; inhibited against



Automatic submerged arc welder is used to weld drum halves together, Gulf Precision Grease and Gulf E.P. Lubricant 95 protect bearings and gears of this machine against excessive wear.



Tubes joined together in butt-welder. The hydraulic system reservoir is filled with Gulf Harmony 44. Gulf Harmony 61 is used in milling machine gear box. Gulf Precision Grease lubricates guide shaft bearings.



Sizing press. Turbine is sized in this press after it goes through swedging, upsetting and bending operations. Ways and shaft bearings are lubricated with Gulf Precision Grease, from central greasing system.

Works Manager R. L. Reed (left) talks with Frank P. Mauro, Gulf Sales Engineer. The drums behind them are being shipped to a new power plant in Santos, Brazil.

& Wilcox reduce
GULF MAKES THINGS RUN BETTER!

rust and corrosion. Next, Gulf E.P. Lubricants—used where shock loads and high pressures are factors. These superb lubricants are non-foaming, noncorrosive and extremely stable. Thirdly, Gulf Lubcote®—tough and tenacious. It protects against wear. And it cushions the sliding and rolling of gear teeth. Lastly, Gulf Precision Grease—a general purpose ball and roller bearing grease to satisfy the plant's grease-lubrication demands.

Simplify your lube inventory with versatile Gulf multipurpose lubricants. And see for yourself how Gulf makes things run better! Just call a Gulf Sales Engineer at your nearest Gulf office. Or write for information.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Houston 2, Texas

GULF

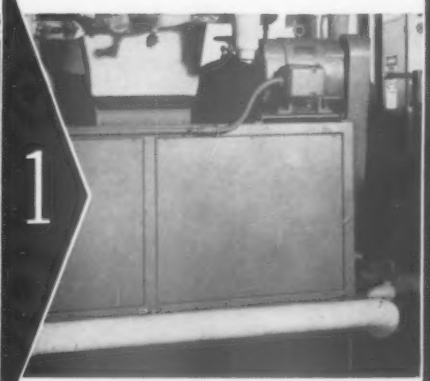
For more facts Circle 425 on Reader Service Card

AAF keeps white-room

3-step air system demonstrates AAF's capability for complete air engineering

AIR FROM C. P. CLARE GENERAL OFFICE (already cleaned by AAF Electro-Matic precipitator) is cleaned again by AAF Electro-PL filters before it enters the air conditioning unit serving the white room.

1



AAF KENNARD/NELSON HIGH-PRESSURE AIR CONDITIONING UNIT controls white room humidity and maintains a temperature of 72° at all times. (To offset heat from manufacturing processes, the air is changed completely every three minutes.)

2

AIR ACTUALLY ENTERING WHITE ROOM is filtered by AAF high-efficiency Type F filters enclosed in the duct running from the outlet of the air conditioning unit to the white room.

3

White room operations involving the assembly of electrical relays demand ultra-clean air and rigidly controlled temperature and humidity. The planners of the new addition at C. P. Clare Co., Chicago, determined that their white room should have a complete air system all its own. Logically, they turned to AAF.

Result: white-room air to white-room standards —99.97% dust-free, constant 72° temperature and accurately controlled humidity.

AAF is the one company that provides all the major components for completely conditioned air. And, just as important, AAF offers the knowledge and experience to coordinate their functioning into one custom-engineered system.

Booklet 518 describes the complete line of American Air Filter component products. If you would like a free copy, address Richard W. Smith, American Air Filter Company, Inc., 361 Central Avenue, Louisville, Kentucky. In Canada, address: American Air Filter of Canada, Ltd., 400 Stinson Blvd., Montreal 9, Quebec.

AAF American Air Filter

BETTER AIR IS OUR BUSINESS

air "*in the pink*"!

AAF

AIR CLEANING PRODUCTS
Air Filters
Dust Collectors

AIR CONDITIONING, HEATING & VENTILATING PRODUCTS

COMPLETELY CONDITIONED AIR

Architects: Rapp & Rapp, Chicago; Consulting Engineers: J. P. Bazzoni & Co., Chicago.

AAF products for complete air engineering

AIR CLEANING: (Atmospheric Dust) *AAF electronic air cleaners,* automatic air filters, *unit filters,* engine & compressor filters. (Process Dust) electrostatic precipitators, wet-type collectors, dry-type collectors, fabric arresters. AIR CONDITIONING, HEATING & VENTILATING: Herman Nelson air conditioning unit ventilators, unit ventilators, portable heaters; Kennard/Nelson dual-duct air conditioning units, multi-zone air conditioning units, *packaged central station air handling units,* sprayed-coil dehumidifiers, fan-coil units, packaged liquid chillers, cooling towers, evaporative condensers, direct-expansion coils, water coils, steam coils, unit blowers, industrial exhausters, centrifugal fans, unit heaters, radiation products; Illinois traps, valves, specialties, heating systems and controls.

● *Italics denote products used in C. P. Clare white room.*

Owner: **DORIC CO.**, Seattle, Wash.
Architect: **DOUGLAS A. BACON**, Bellevue, Wash.
Electrical Contractor:
LAKESIDE ELECTRIC CO.
Bellevue, Wash.

Electrical Protection goes MODERN *with* BUSS Fuses...

at the Doric 6th. Avenue Motor Hotel, Seattle, Wash.

Travelers staying at this new, luxurious 175 unit motor hotel enjoy the latest conveniences of electrical living. Even the rooms are heated electrically so each person may select the room temperature he prefers.

These modern services require large electrical capacity. As a result, the available fault current is approximately 70,000 amperes.

Safe protection against faults of this magnitude is assured by the BUSS Hi-Cap fuses installed in the main entrance service. These fuses have an interrupting rating of 200,000 amperes rms. symmetrical.

To maintain safe, modern protection throughout the electrical system,—and to safeguard against unnecessary interruptions in electrical service, FUSETRON dual-element fuses are installed in the branch circuit switches.

ANOTHER BUSS HI-CAP AND FUSETRON FUSE INSTALLATION

761

There is a safe, modern BUSS or FUSETRON fuse with specific characteristics to match your requirements.

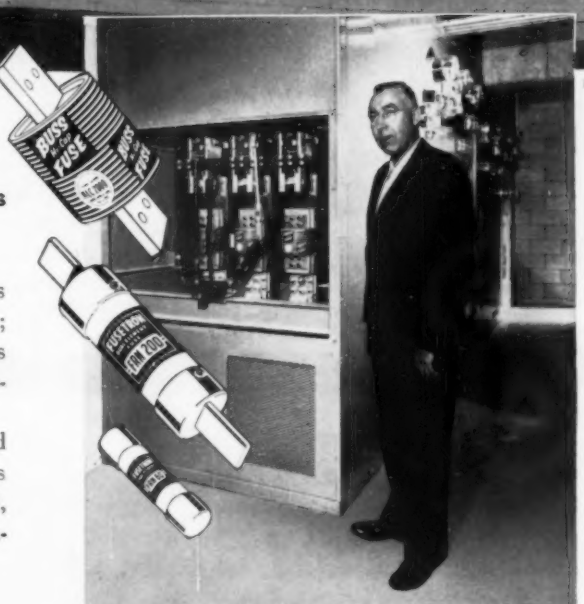
Available from BUSS: High interrupting capacity fuses to protect against fault currents up to 200,000 amperes; current-limiting fuses to restrict let-thru fault currents to safe values; long time-lag (dual-element) fuses to prevent needless outages on harmless overloads.

And with Fuses safe protection remains safe. BUSS and FUSETRON fuses are just as safe and accurate 20 years or longer after installation as on the day installed. Dust, fumes, corrosion or age cannot prevent them from opening when they should.

For more information on

FUSETRON dual-element fuses
(loads of 0 to 600 amps.) ..... **write for bulletin FIS**

BUSS Hi-Cap fuses
(loads above 600 amps.) ..... **write for bulletin HCS**



Mr. S. Andrew Sharpe, Manager of Lakeside Electric Co., at main switchboard of Doric Motor Hotel.

Mains and feeders protected with BUSS Hi-Cap fuses. Branch circuits protected by FUSETRON dual-element fuses.

BUSSMANN MFG. DIVISION, *McGraw-Edison Co.* **ST. LOUIS 7, MO.**

For more facts Circle 427 on Reader Service Card

How can you cut the cost of electrical repair?

More and more maintenance managers we've talked to are being asked one of two vital questions by their management: "How much can you cut your maintenance budget this year?" or "How much better maintenance will you provide for the same dollars?"

Is there any way out of such a cost squeeze?

Yes! Many managers have cut down on the amount of repair work they do themselves, place this work with outside specialists, spend more time on preventive maintenance.

R. L. Kirkpatrick, Manager, Maintenance Sales, Westinghouse Electric Corporation.

How does this help reduce costs? A good part of the answer lies in what a modern repair plant is and how it operates. First, modern repair plants are experts in building maximum reliability into repaired equipment . . . and they *guarantee* their work. For example, on rewound motors, the guarantee is the same as new motors. Secondly, they are staffed with factory-trained technicians and equipped with the latest and most complete facilities to handle every size and type of electrical equipment.

Often, the repaired equipment, when returned, is better than when new because only the latest materials and techniques have been employed. Specialized test and inspection instruments are used to thoroughly diagnose incoming equipment for engineered repair—and to thoroughly check-out equipment being returned to your production lines.

These expert services are available round-the-clock, seven days a week. Most important, you pay for these services *only when used* and avoid the continuing overhead inherent in an in-plant repair facility.

There is sizeable evidence that consigning repair work to outside experts cuts your repair costs, improves performance reliability, extends the life of the equipment, releases people, dollars, and floor space for production and increased preventive maintenance activities.

Isn't this the way for YOU to cut the cost of electrical repair?

Pittsburgh Coke & Chemical saves thousands annually with Westinghouse Repair service

Other Pittsburgh Coke & Chemical motors, located outdoors, are used to drive chemical and water pumps. These motors operate in an area, near giant 10,000 gallon chemical tanks, that is filled with moisture concentration, and subjected to fumes from caustic coal tar acids.

You can save important repair dollars, like this customer did—

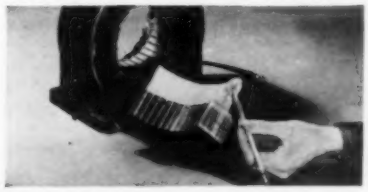
The problem: How to keep 15 motors operationally reliable at Pittsburgh Coke & Chemical Company. These motors, ranging from 3 to 60 hp, of both totally-enclosed-fan-cooled and explosion-proof types, are constantly subjected to high moisture, dust, and corrosive chemical conditions.

Such difficult conditions grounded windings, causing the motors to "burn out," thus cutting off conveyor belt runs, and stopping chemical and water pumps.

One example: A 5-hp Class B insulated motor, located above a quenched coke conveyor belt and in a partially enclosed structure, was under constant contamination attack. Steam condensation caused intense moisture concentration in the confined area, which was also subjected to coke dust. Result? Frequent motor failure, and necessity for rewinding. Costs? The cost of rewinding, the time of men to remove the motor, and the downtime.

The solution: Westinghouse was called in. After analyzing the problem, a solventless epoxy protective encapsulation, Super COILIFE,* was applied to the rewound motor by an exclusive Westinghouse process. This motor operated continuously for 14 months – then stopped only because of a line failure. Other motors are located in the open air, or near pumps and tanks—subject to humidity and caustic coal tar acids, such as phenol. With Super COILIFE encapsulation they now provide uninterrupted service . . . and major yearly savings, reports Pittsburgh Coke and Chemical.

This example is only one of many hundreds illustrating what Westinghouse's comprehensive maintenance service provides . . . for every type of plant, on every kind of electrical or steam equipment. 41 modern plants rebuild, repair, uprate, add new features, and protect such equipment with exclusive insulations such as Thermalastic® and Super COILIFE. Visit your nearby Westinghouse Repair plant and see how modern facilities plus factory-trained technicians can help reduce your costs. Most important,



Pencil points to location where coils are subject to failures caused by dust and chemical deposits. The solventless epoxy, "Super COILIFE," applied at Westinghouse's Repair plant provides complete protection of windings, locking out all foreign matter that might cause them to ground, and the motor to fail.

call in your Westinghouse Representative soon for a review of your repair problems.

"Maintenance Modernization Means Profits" (B-8223), a new booklet defining the total scope of Westinghouse Maintenance Services, is available on request. Write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

Five-horsepower motor which moves conveyor belt section at Pittsburgh Coke & Chemical Company is examined by chief electrician. In this service, the motor is under the attack of intense steam condensation and extreme coke dust conditions.

You can be sure . . . if it's

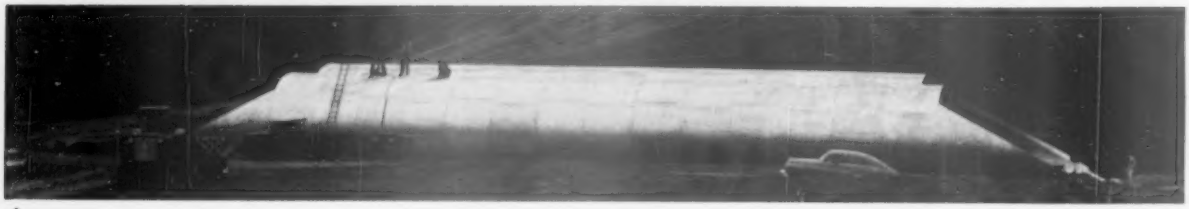
Westinghouse

*Trademark

J-95220

New steels are born at Armco

Armco MULTI-PLATE Pipe Makes Economical Vehicular Underpass



View of construction site of twin underpass as erection crew bolts last plates of the MULTI-PLATE Structure.

Auto travels through completed MULTI-PLATE underpass while freight train, serving the coal mine, goes by overhead.

For strength, economy, durability — Steel

In constructing a railroad spur line to a new coal mine in Alabama, it was necessary to cross over a paved farm-to-market road. After careful consideration, owners of the mine decided on twin Armco MULTI-PLATE® Pipes for the two-way vehicular underpass.

An important factor was that corrugated metal MULTI-PLATE assured considerable savings over other types of bridging structures.

Each of the two lines of MULTI-PLATE Pipe was 17½ feet in nominal diameter, 168 feet long. Double railroad tracks are on a 32-foot wide roadbed, on top of the 25-foot fill.

Besides underpasses, industry uses MULTI-PLATE Structures for stream enclosures, access road bridges, and aggregate conveyor tunnels. Call your local Armco Sales Engineer for data on your specific needs, or write us for catalog. **Armco Drainage & Metal Products, Inc., subsidiary of Armco Steel Corporation, 6811 Curtis Street, Middletown, Ohio.**

ARMCO **Drainage & Metal Products**

For more facts Circle 429 on Reader Service Card

Circle 430 on Reader Service Card for items on next page

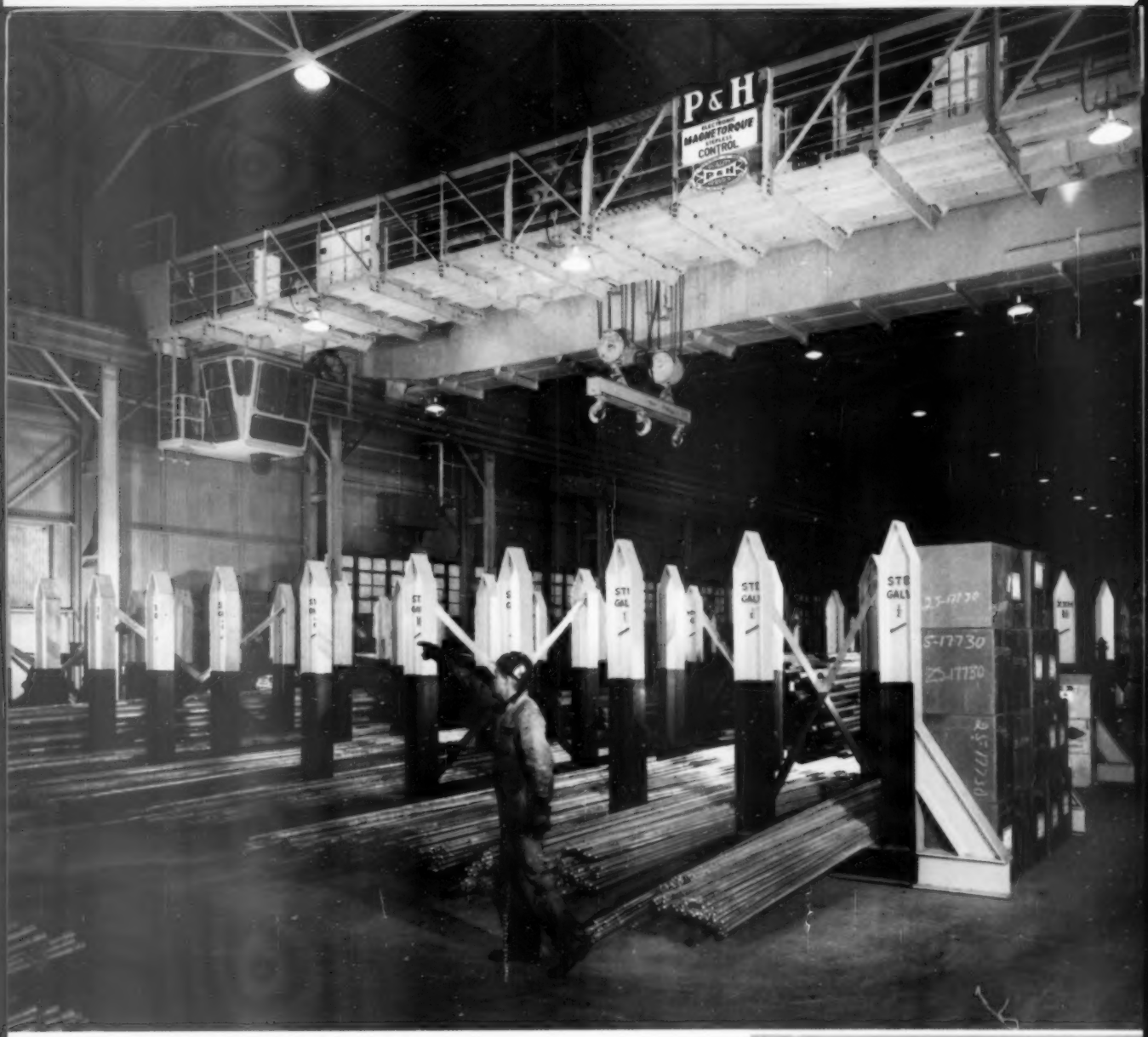


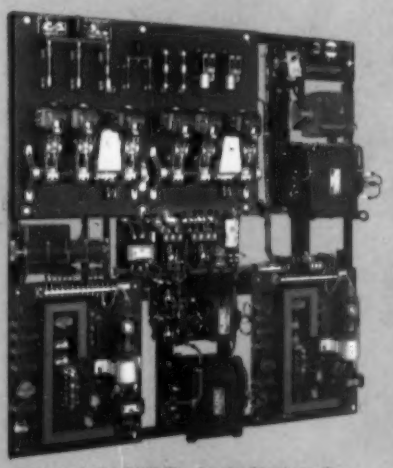
Photo courtesy Inland Steel Company, Chicago, Illinois

FOR EVERY APPLICATION, THERE'S ONE CRANE OUTSTANDING . . . P&H!

In steel mill warehousing, thanks to P&H Electronic Stepless Control, this crane moves heavy loads at high speeds, yet spots them with damage-free gentleness.

The crane is equipped with special tandem hooks — as well as other interchangeable handling equipment — and a clear-vision cab to increase the efficiency of handling steel in and out of convenient top-loading storage racks.

All these useful advantages are the result of P&H experience in crane application engineering. Call in your local P&H crane salesman to help analyze your requirements *before* you draw up your next crane specification. Then send your inquiry where most buyers do: to Harnischfeger, world's largest builder of overhead cranes.



Heart of the P&H Electronic Stepless Control is this a-c electronic control panel. With this control on a three-motor crane, as many as 244 conventional electrical parts are eliminated! Remember, Harnischfeger pioneered this modern concept of crane control . . . over 1000 successful installations to date . . . more than all other manufacturers combined!

HARNISCHFEGER **P&H**
Milwaukee 46, Wisconsin
OVERHEAD CRANES

Offices in major cities . . . see Yellow Pages

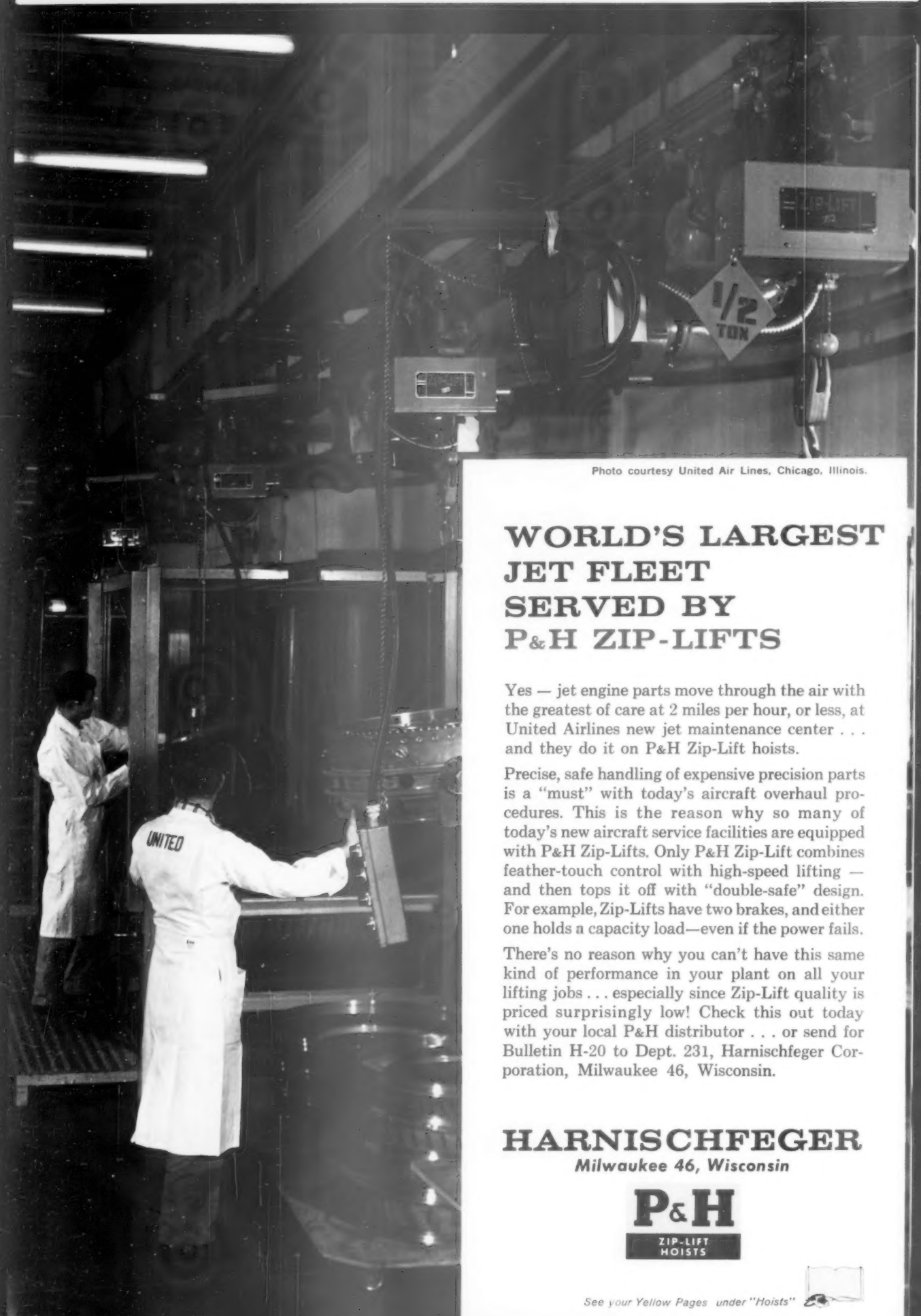


Photo courtesy United Air Lines, Chicago, Illinois.

WORLD'S LARGEST JET FLEET SERVED BY P&H ZIP-LIFTS

Yes — jet engine parts move through the air with the greatest of care at 2 miles per hour, or less, at United Airlines new jet maintenance center . . . and they do it on P&H Zip-Lift hoists.

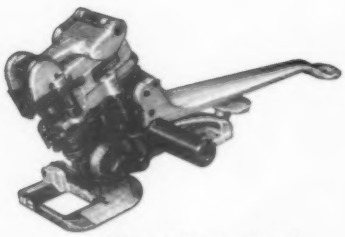
Precise, safe handling of expensive precision parts is a "must" with today's aircraft overhaul procedures. This is the reason why so many of today's new aircraft service facilities are equipped with P&H Zip-Lifts. Only P&H Zip-Lift combines feather-touch control with high-speed lifting — and then tops it off with "double-safe" design. For example, Zip-Lifts have two brakes, and either one holds a capacity load—even if the power fails.

There's no reason why you can't have this same kind of performance in your plant on all your lifting jobs . . . especially since Zip-Lift quality is priced surprisingly low! Check this out today with your local P&H distributor . . . or send for Bulletin H-20 to Dept. 231, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

HARNISCHFEGER
Milwaukee 46, Wisconsin

P&H
ZIP-LIFT HOISTS

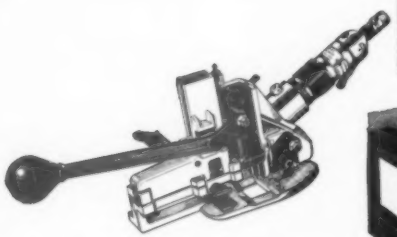
See your Yellow Pages under "Hoists"



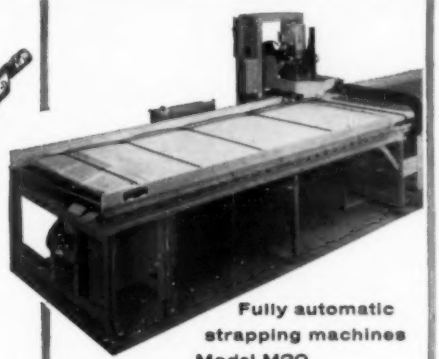
The only one-hand strapping tools
SFC Series

Power strap feeders
Model PSF

Complete line of air power tensioners
PN Series

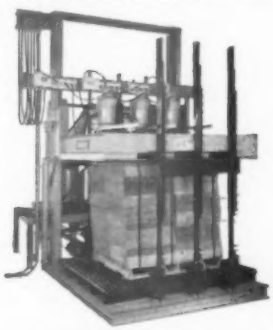


Air and electric power portable strapping machines
AP and AE Series



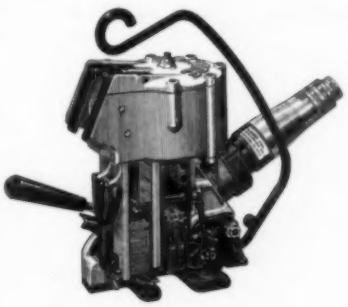
Fully automatic strapping machines
Model M20

The first air power feed wheel tensioner for heavy duty strapping
FN Series



First completely automatic compression strapping machines
CSM Series

Heavy-duty ¾-inch pistol grip air power sealers
Model RCNS



Air power tensions, seals, and severs the strapping
AMP Series

Make your product cost less to handle, store, ship and receive

Binding things together with steel strapping is a low cost way to eliminate individual handlings, save space, and prevent damage. These nine machines—part of the most complete line of equipment in the steel strapping industry—create new ways to make your product cost less to handle, store, ship and receive. For additional information on any or all of these tools, write:

SIGNODE
STEEL STRAPPING CO.
2663 North Western Avenue • Chicago 47, Illinois
In Canada: Canadian Steel Strapping Co., Ltd., Montreal • Toronto

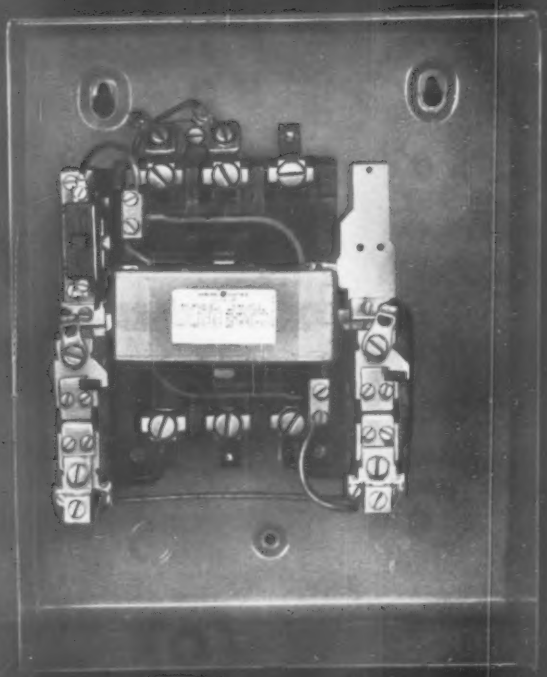
First in steel strapping

◀ For more facts Circle 431 on Reader Service Card

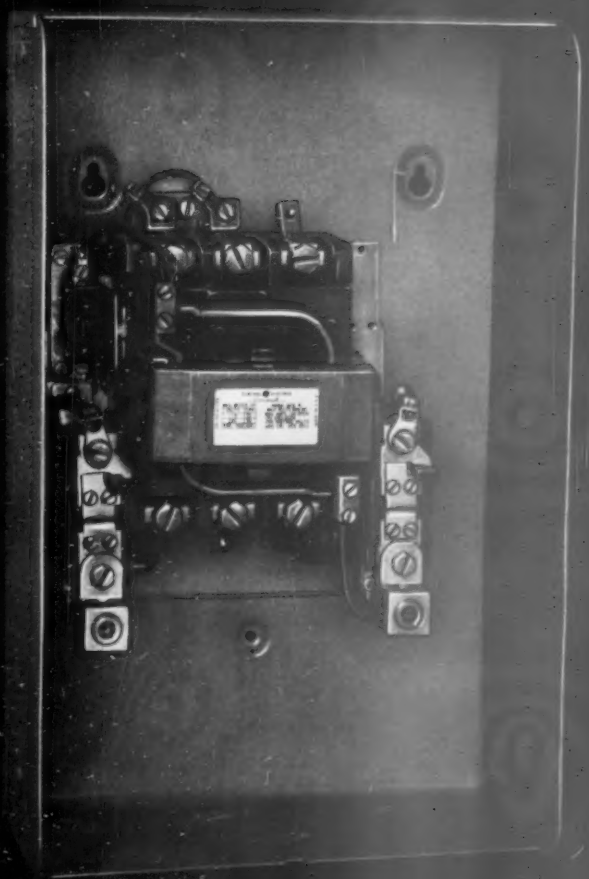
For more facts Circle 432 on Reader Service Card

From General Electric . . .

NEW NEMA SIZE 3 NEMA SIZE 4 STARTERS



SIZE 3



SIZE 4

Field-proved 100-Line design—now available in Sizes 00 through 4—offers you unmatched savings in maintenance time and dollars.

Inspect Contacts, Change Coil Without Tools Even on Size 4!

Imagine how much maintenance time and expense you can save with these new General Electric 100-Line starters! Without using even a screwdriver, you can inspect contacts in *10 seconds*, change coil in *20 seconds*. This is convenience no other starter can offer.

These new 100-Line Sizes 3 and 4 starters also give you the benefits of a design *field-proved* on over one million applications:

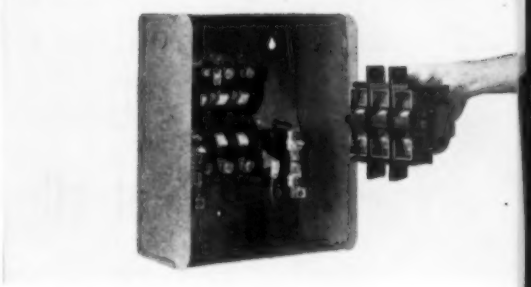
- Straight-through wiring saves hook-up time. All line terminals are on top, all load terminals on bottom.
- Pressure-type terminals accept wire through size 1/0 on Size 3 and 250 MCM cable on Size 4.
- Durable molded Strongbox coil resists dirt, moisture, oil, and mechanical damage.
- Slanted contacts shrug off dust and other contaminants.
- Wedge-action contacts close at an angle to reduce bounce and resultant arcing and pitting.

New General Electric 100-Line Sizes 3 and 4 starters are now available, enclosed or open, in all popular forms. Call your G-E sales engineer or distributor. Or, write for new publication GEA-7326, to Section 813-36, General Electric Co., Schenectady 5, New York.

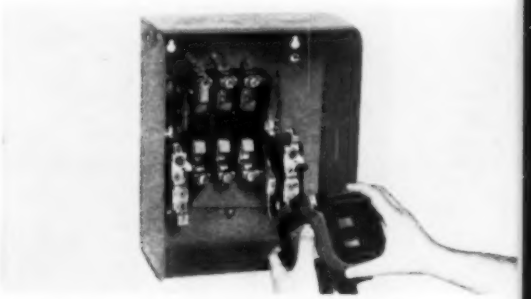
You Get MEASURABLE ADVANTAGES WITH GENERAL ELECTRIC CONTROL

Progress Is Our Most Important Product

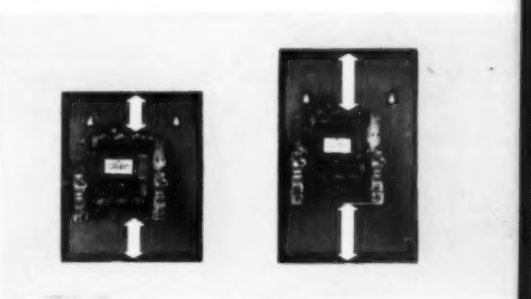
GENERAL ELECTRIC



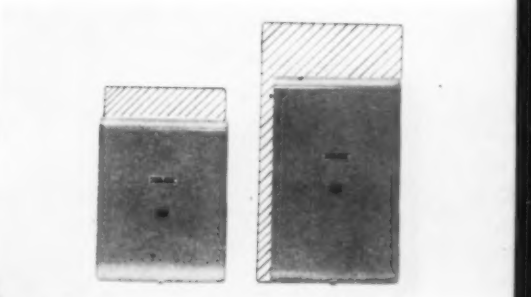
Inspect all contacts in 10 seconds without tools. Simply lift off spring-loaded retainers on upper right and lower left of coil. Entire movable assembly—including contacts, magnet, and coil—slides out for inspection. Both stationary and movable contacts are visible.



Change coil in only 20 seconds without tools. Lift off the two coil retainers and slide out movable contacts, magnet, and coil assembly. Remove spring-clip in "I" magnet and take off "I" magnet. Molded Strongbox coil can now be lifted off the "E" magnet.

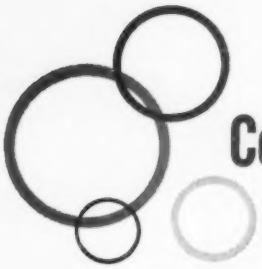


You get plenty of wiring room. Enclosures on these new starters give you 3¼ inches of wiring space at top and bottom on Size 3; 5½ inches top and bottom on Size 4. All line terminals are at top, load terminals at bottom for easy hook-up.



Significantly smaller than previous forms. New enclosed 100-Line starters are 9% to 23% smaller in area, fit where others won't. Size 3 enclosure is only 15⅛ inches high, 12⅛ inches wide, 7⅞ inches deep. Size 4 is 20⅛ x 12⅛ x 7⅞ inches. (Depth dimensions include reset button.) Compare with other makes.

For more facts Circle 433 on Reader Service Card



Controlled environment assures uniform product quality, boosts "O" ring output

Controlled thermal conditions play a vital role in the manufacture of rubber "O" rings at Lebanon Manufacturing Company, Lebanon, Tennessee, a Division of Precision Rubber Products Corporation.

A specially designed Johnson Air Conditioning Control System maintains the exact temperatures required for the various manufacturing operations as well as for the comfort of plant and office personnel. Of particular importance is the need for temperature control that permits manufacturing to extremely close tolerances.

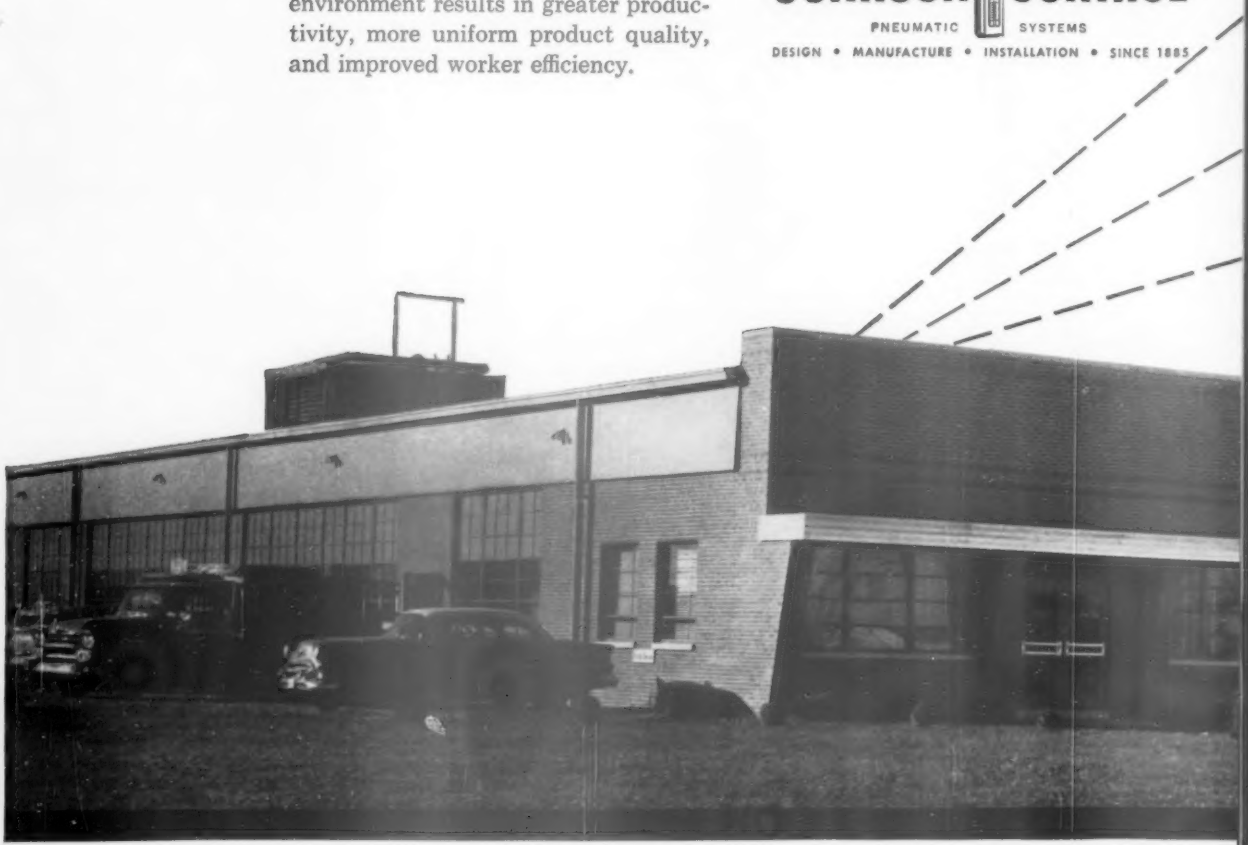
Here, as in thousands of other Johnson-equipped plants, a controlled thermal environment results in greater productivity, more uniform product quality, and improved worker efficiency.

Johnson Pneumatic Control Systems are applied to all types and makes of air conditioning, heating, and ventilating equipment and to a wide range of industrial processes. Each system is engineered and installed to meet the specific requirements of the individual plant. Next time you are considering controls, investigate the advantages Johnson Control can give you — in performance, dependability, and operational savings. Johnson Service Company, Milwaukee 1, Wisconsin. 105 Direct Branch Offices.

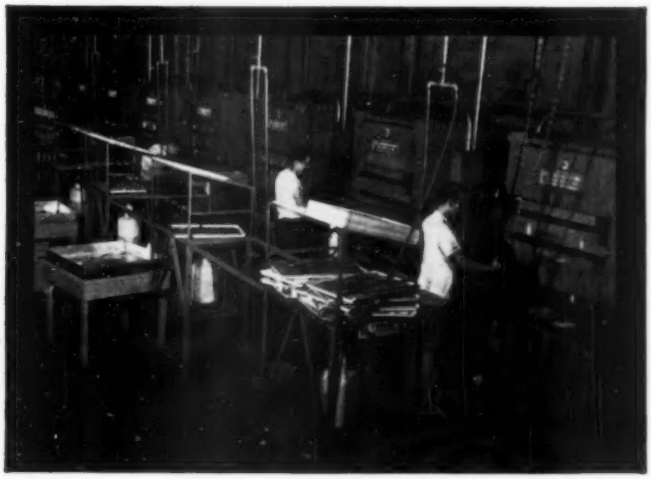
JOHNSON CONTROL

PNEUMATIC SYSTEMS

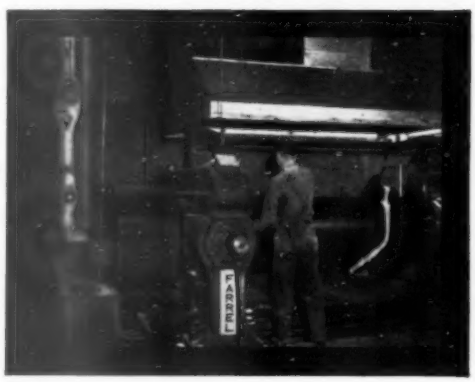
DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885



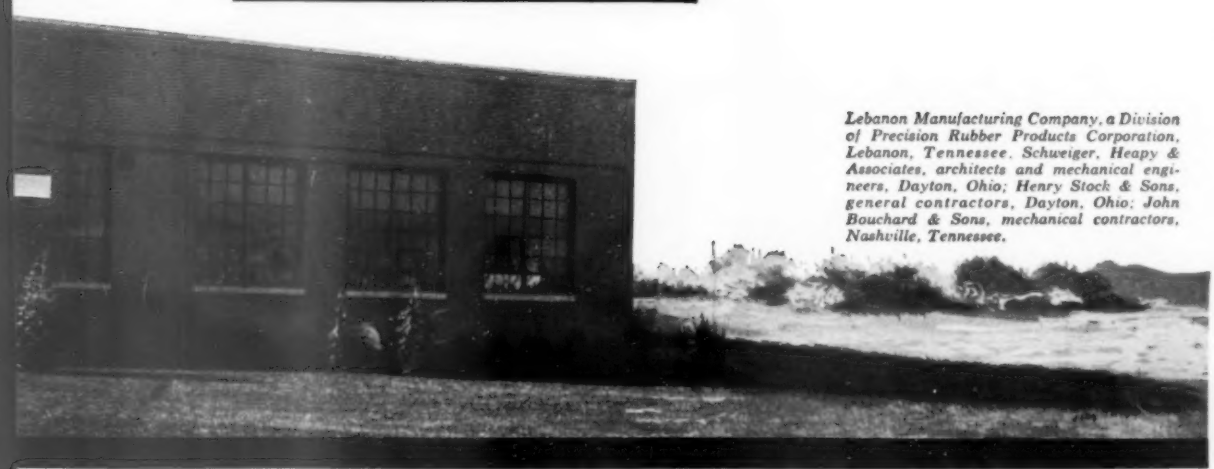
Blanks for rubber "O" rings are stamped from sheet stock. Controlled air conditions are necessary to assure sharp, clean cuts.



In the press room, blanks are molded into finished "O" rings. After molding, controlled temperatures keep rings from becoming sticky and eliminate handling problems during trimming and final inspection.



To compensate for heat generated by the re-sheeting presses and to allow continuous operation, a Johnson thermostat and chilled water valve supply 40F water for the press rolls.



Lebanon Manufacturing Company, a Division of Precision Rubber Products Corporation, Lebanon, Tennessee. Schweiger, Heapy & Associates, architects and mechanical engineers, Dayton, Ohio; Henry Stock & Sons, general contractors, Dayton, Ohio; John Bouchard & Sons, mechanical contractors, Nashville, Tennessee.

INDUSTRY'S MOST PRODUCTIVE LINE

CP . . . pioneer in "One-Shot" Torque Control Tools for Threaded Fastener Driving

Chicago Pneumatic has maintained industry leadership in the development of Torque Control Tools since the first "one-shot" screwdriver was announced in 1954.

If you drive threaded fasteners, there's a CP Screwdriver, Nutrunner, Multi-Runner or Impact Wrench to meet your production line problems.

Fast, accurate driving can save you as much as 75% in time . . . hold rejects to a minimum. Shown here are some of the latest CP tools for threaded fastener driving . . . *industry's most productive line.* Let our Torque Control Specialists help solve your fastener driving problems. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

TORQUE ANALYZER FOR "ONE-SHOT" TOOLS

provides a fast and simple method for testing and calibrating torque control tools. For fasteners as large as 5/16". Maximum capacity: 200 inch-pounds.

OF SCREWDRIVERS AND NUTRUNNERS

NEW DIAL TORK NUTRUNNER

adjustable at the bench to meet a variety of torque specifications on the same job. So accurate it eliminates final tightening with a hand torque wrench. Capacity: #12 to 5/16" machine screws. Adjustable from 50 to 180 inch-pounds.

MICROMETER TYPE TORQUE SELECTOR

lets operator "dial-in" the torque he needs for each size of fastener.

"ONE-SHOT" TORQUE CONTROL SCREWDRIVERS

feature the famous CP "one-shot" clutch and silent exhaust. Capacity: #4 to 1/4" machine screws. Adjustable from 7 to 100 inch-pounds.

"JOLT-FREE" TORQUE CONTROL ANGLE NUTRUNNERS

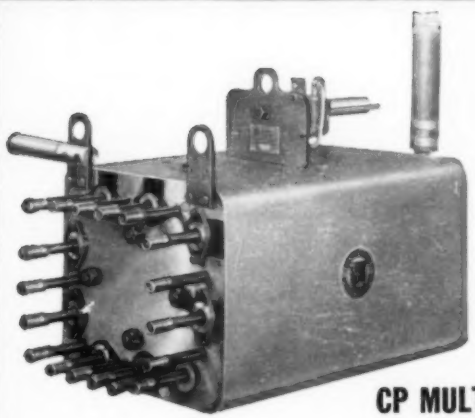
Great time-savers for hard-to-reach jobs. Range of torque adjustment: 6 to 70 foot-pounds.

TORQUE CONTROL IMPACT WRENCHES

Recommended where torque limits are critical. Sensing mechanism cuts-off tool air supply the instant specified torque is reached. Capacity to 1 1/8" bolt size. Range of torque adjustment: 12 to 1000 foot-pounds.

NEW CP-606 IMPACT WRENCH

...a real powerhouse. Gives fast rundowns...loosens frozen nuts or bolts fast. Capacity: 3/4" square drive; 3/4" bolt size.



CP MULTI-RUNNERS

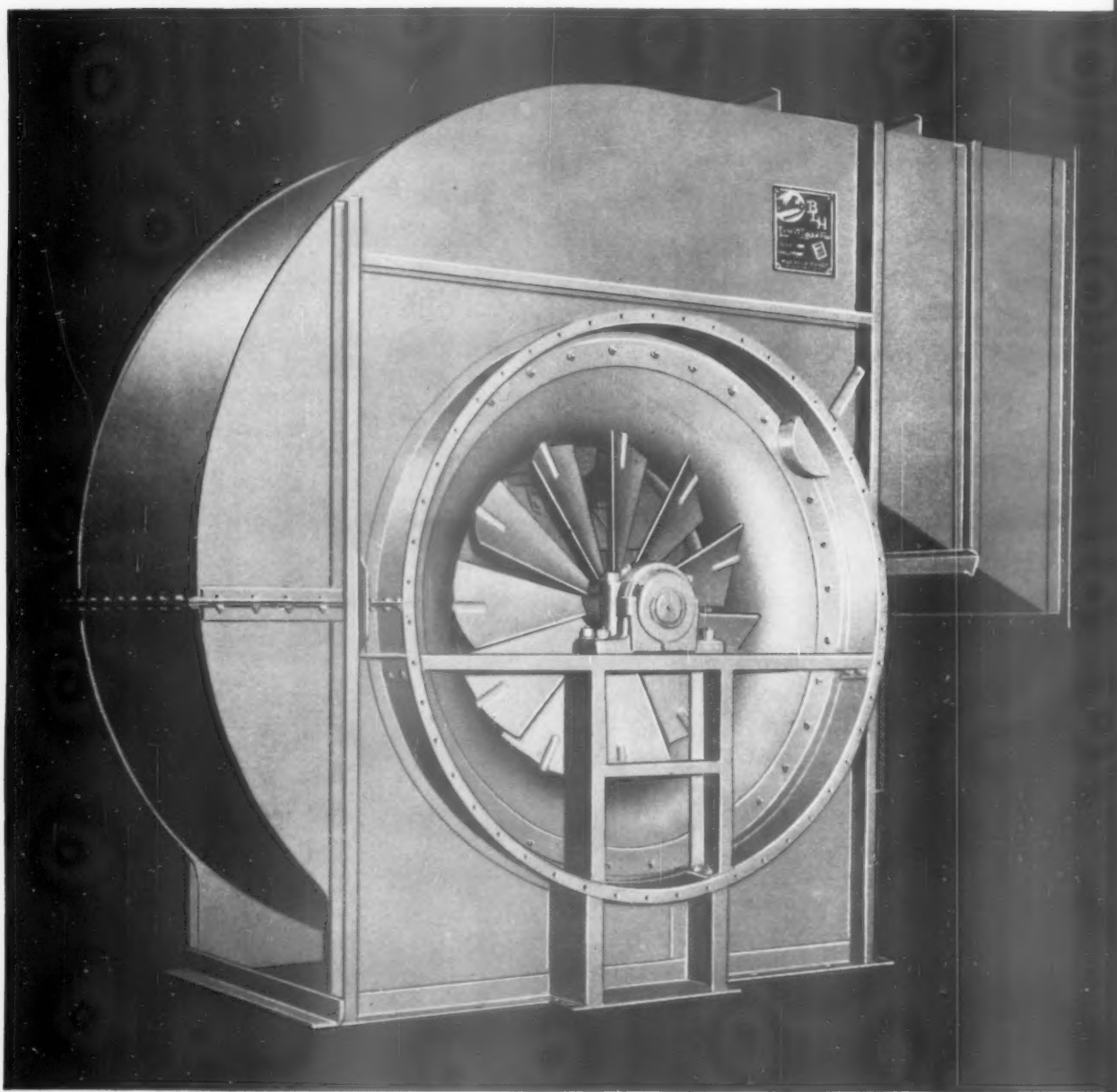
drive every fastener "just right." Husky motors and "one-shot" clutches insure proper tightness, eliminate work spoilage.

NEW CP-6020 IMPACT WRENCH

Hand-sized, but a man-sized performer, this 1/4" bolt size capacity tool packs a fist full of power. 8 models with lever or offset handle. 3/8" square drive, or 3 sizes of hex slip chucks: 1/4", 5/16" and 7/16".

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • ELECTRIC TOOLS • AIR COMPRESSORS • DIESEL ENGINES • HYDRAULIC TOOLS • AVIATION ACCESSORIES

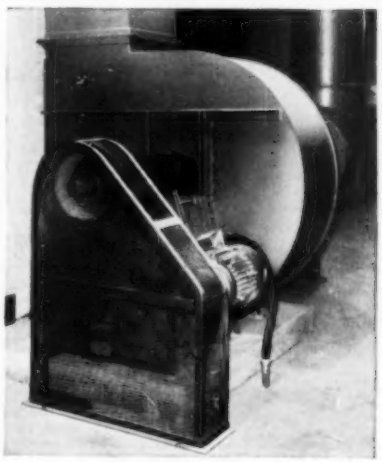


'Buffalo' Builds Air Handling Equipment for Every Plant and Every Air Job

EFFICIENT PLANT-WIDE VENTILATION starts with efficient fans. 'Buffalo' Type BLH Fans deliver the required tonnage of air where you want it, for the least driving power. Large installations like these are providing economical exhaust, ventilation, and air conditioning supply in every branch of industry, on a wide range of applications up to Class IV air handling. 'Buffalo' BLH Fans are furnishing air for power, air for comfort, air for efficiency and air for process and quality control—on a basis of permanent reliability and overall economy through the years.

Good AIR MANAGEMENT
Lowers Plant Operating Costs

FOR EXHAUSTING AIR OR MATERIALS, 'Buffalo' Industrial Exhausters are built of heavy, all-welded, frictionless steel plate housings and blades to handle the most punishing air jobs. Available with highly efficient air wheel (type AW), front-flanged material wheel (type MW), or open material wheel (type OW) without front flange. Applications range from moving clean air to abrasive and stringy materials. When equipped with heat slinger and high temperature bearings gases to 850° F. may be handled. Special construction offered for corrosive fumes.



FOR AIR PURIFICATION—'Buffalo' Gas Absorbers can clean the air for you! For removing entrained particulate matter from dryer vents, for eliminating nuisance gases from purge streams, for scrubbing or absorbing corrosive acid mists and fumes. Special designs for special applications — construction in carbon steel, rubber-lined steel, stainless and lightweight reinforced resin-bonded fiberglass for corrosive conditions.

HANDLING CORROSIVE FUMES that would quickly destroy ordinary metal fans is the specialized job of 'Buffalo' Resin-Bonded Fiberglass Fans. Fiberglass construction provides protection over a wide spectrum of acids, alkalies and other corrosive fumes, mists and gases. 'Buffalo' Fiberglass Fans are resistant to heat, corrosion, erosion, and impact — save you their cost many times over in replacement and down-time expense.

EFFICIENT ZONE VENTILATION—free air delivery or duct-connected to specified plant areas—is just what 'Buffalo' Belted Vent Sets are made for! A number of these lightweight units, can provide savings over a single large fan ventilating the same zones. Belted Vent Sets feature the quiet operation, non-overloading horsepower characteristic and high efficiencies built into the largest and finest 'Buffalo' Centrifugal fans. Capacities to 20,000 cfm.

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

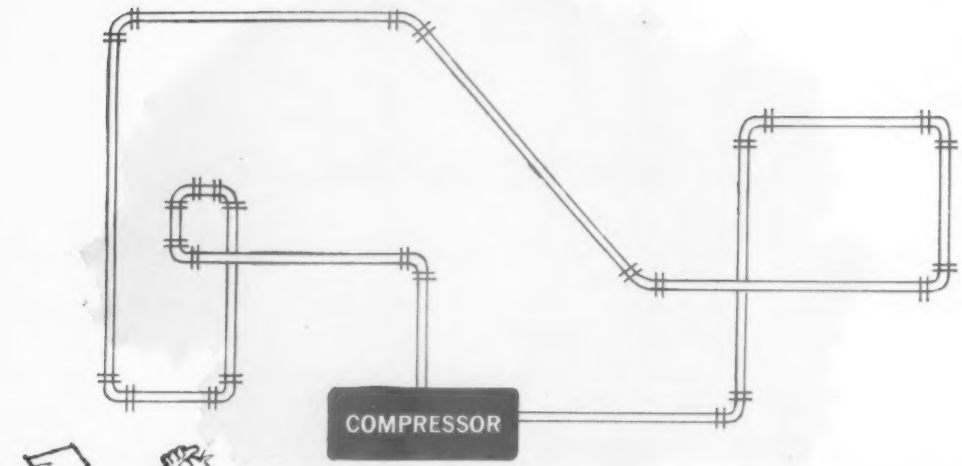
"Buffalo"

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.



when you discuss your compressor system, what does **PAR** mean to you?

THE WORD HAS MANY DEFINITIONS

PAR to the golfer means the number of strokes allotted per hole or for the round of golf.

PAR to the investor is the established nominal value of a security or certificate of stock.

PAR can be an amount which is taken as an average or mean... an average level, etc.

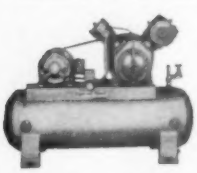
Possibly the only connotation you might place on PAR is the expression that it's either up to PAR or not up to PAR, meaning up to standard.

BUT THERE'S ANOTHER MEANING TOO

At Ingersoll-Rand Company we like to think of PAR in terms of a "PLANNED ANNUAL REVIEW" of a customer's air power system. The newest, most efficient air-operated devices are only as effective as the power that drives them, and usually low air pressure is the reason for equipment not functioning properly.

An Ingersoll-Rand AIRengineer will be happy to help you plan present or future air requirements and keep you abreast of the latest developments in tools and air systems. He will make sure you get the biggest dividend on your payroll dollars from a carefully PLANNED ANNUAL REVIEW of your air power system. Let us schedule a PAR for you now.

Air-cooled compressors 1/2 through 125 horsepower



Type 30 Compressors
1/2 through 20 hp
pressures to 250 psi

Type 40 Compressors
25 through 125 hp
pressures to 125 psi

Ingersoll-Rand
248A3 ♥ 11 Broadway, New York 4, N. Y.

OTHER I-R COMPRESSORS TO 7500 HP—PRESSURES TO 5000 PSIG.

For more facts Circle 437 on Reader Service Card

WHEN THE PROBLEM CALLS FOR PAINT THE BEST ANSWER

IS INVARIABLY **Barreled Sunlight** ENGINEERED *Paints*

Washability is a major consideration in the selection of industrial paints — particularly where good housekeeping practices and high visibility standards demand frequent floor, wall and ceiling "scrubdowns".

The trick is to select paints which not only resist the abrasive action of water and cleaning compounds but which are *engineered* to provide maximum painting economy as well. And *this* is why the recommendations of Barreled Sunlight Engineered Paint representatives are acted upon so many times in so many plants. On job after job, the paints they recommend more than meet the toughest tests . . . *invariably* provide a better looking, longer lasting paint job at lower cost.

It will cost you less — now and in the long run — to talk over your plant paint requirements with a Barreled Sunlight representative. The coupon below is your invitation for a free consultation without obligation.

FREE! BARRELED SUNLIGHT PAINT "SLIDE GUIDE"

Contains complete information on Barreled Sunlight Exterior and Interior Finishes, Colors, Primers, and Thinners plus full application and special resistance data.

BARRELED SUNLIGHT PAINT COMPANY
1247 Georgia Avenue, Providence 5, Rhode Island

I want to learn more about Barreled Sunlight Engineered Paints and what they can do for us.

☐ Please have your representative call me to arrange an appointment without obligation.

☐ Please send me your new "Slide Guide" to Barreled Sunlight Paints.

Name.....

Title.....

Company.....

City.....*Zone*.....*State*.....

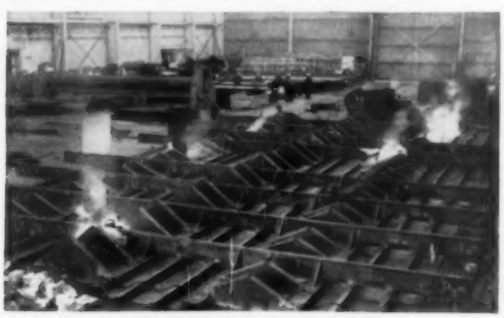
Solve any manual welding problem with ▸▸▸
. . . welders that have the greatest operator appeal—Lincoln **Idealarcs.** Men work better with these machines simply because they like them better.

▸▸▸LINCOLN IDEALARC WELDERS

TM, R3M and TIG are the designations for the families of Lincoln heavy-duty Idealarc welders. R3M uses DC electrodes only; the TM, both AC and DC electrodes; and the TIG, either type electrode plus the inert gas process. One or more of these machines will handle every conceivable manual welding task, and, at the same time, permit your operations to stay flexible to meet future market conditions or accommodate newly developed electrodes. And do it profitably!

Shipyard work has flat fabrication where high-speed AC electrodes are best—and vertical and overhead welding when DC is preferred. *Idealarc TM's* are available in two models—straight AC, and AC/DC. The latter was used here since with it, you can change from one current to the other just by flipping a switch . . . that fast. This kind of flexibility lets you stay competitive as demand for high speeds and top electrode performance increases.

While stick welding makes up the bulk of most shop work, there is a growing use of stainless steels, aluminum, magnesium and other non-ferrous metals which are welded with an inert gas shield. Lincoln's *Idealarc TIG* welder provides both AC and DC currents plus high frequency, gas and water controls for the Tungsten Inert Gas process. It is the most complete, most versatile machine made for manual welding, and thus is ideal for large job shops.



Structural and heavy equipment fabricators feel that low machine cost plus reliability are the keys to profits on long-run, repetitive production work such as this. *Idealarc TM's* were chosen here since they are the lowest cost, straight AC welder made. And they have proved dependable through years of hard service. Get facts about Idealarcs from your Lincoln field engineer . . . a specialist in welding. Or write for bulletins which describe each machine in detail.

THE LINCOLN ELECTRIC COMPANY • DEPT. 1841 • CLEVELAND 17, OHIO

LINCOLN WELDERS

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT AND ELECTRODES

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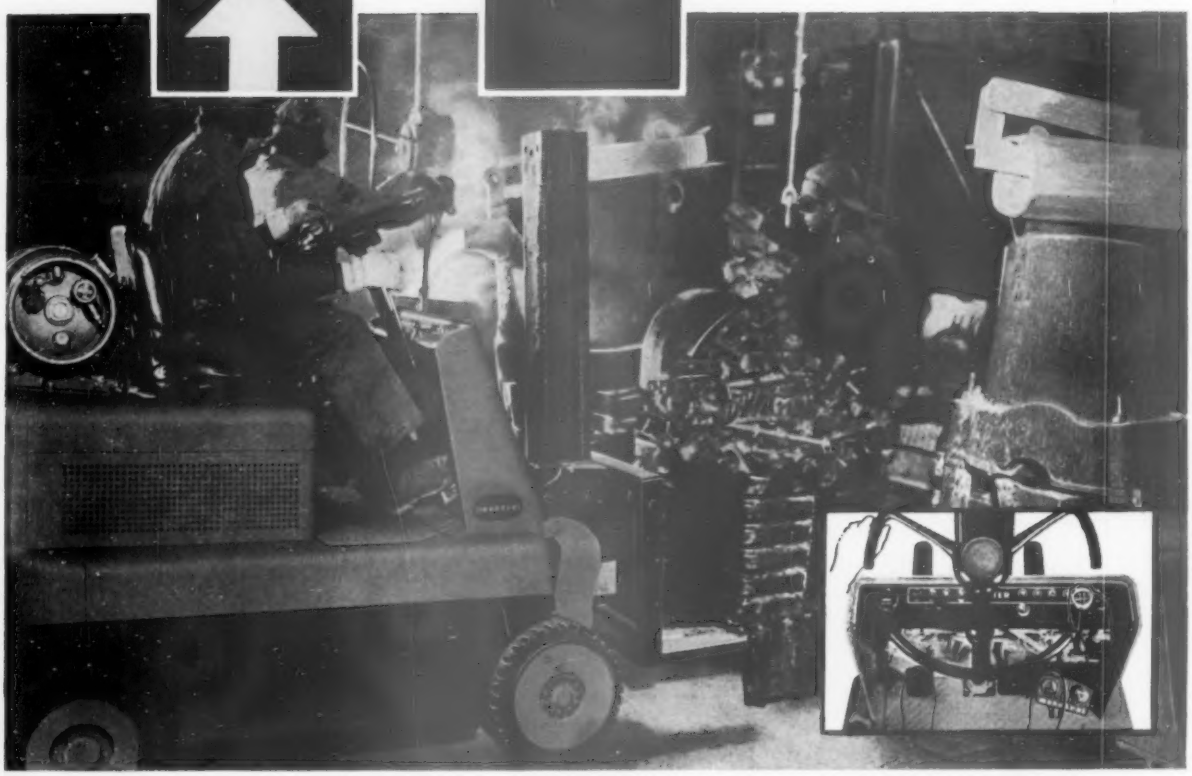
HYSTER



monotrol speeds production handling

Only

HYSTER® has it!

At American-Standard Plumbing & Heating Division—Hyster lift truck with Monotrol control handles millions of pounds per month—in brass foundry at Cincinnati, Ohio.

All driving functions except steering are foot controlled—for safe, rapid handling.

Right foot Monotrol pedal controls power—forward-reverse—Hystamatic transmission. Left foot controls brakes and truck inching. Hands are free for steering and load control.

Safest, easiest trucks to drive. Quickest to service—cheapest to maintain.

Call your Hyster dealer or write for literature.

INDUSTRIAL TRUCK DIVISION—Lift trucks, mobile cranes, straddle carriers
TRACTOR EQUIPMENT DIVISION—Construction and logging equipment
MARTIN TRAILER DIVISION—Heavy machinery hauling trailers
INTERNATIONAL DIVISION—Overseas manufacturing, sales and service

Manufactured in: Portland, Oregon (Home Office) • Danville, Ill. • Peoria, Ill. • Kewanee, Ill. • Australia • Brazil • England • France • The Netherlands • Scotland • Union of South Africa

HYSTER COMPANY
INDUSTRIAL TRUCK DIVISION
P. O. Box 847 Danville, Illinois

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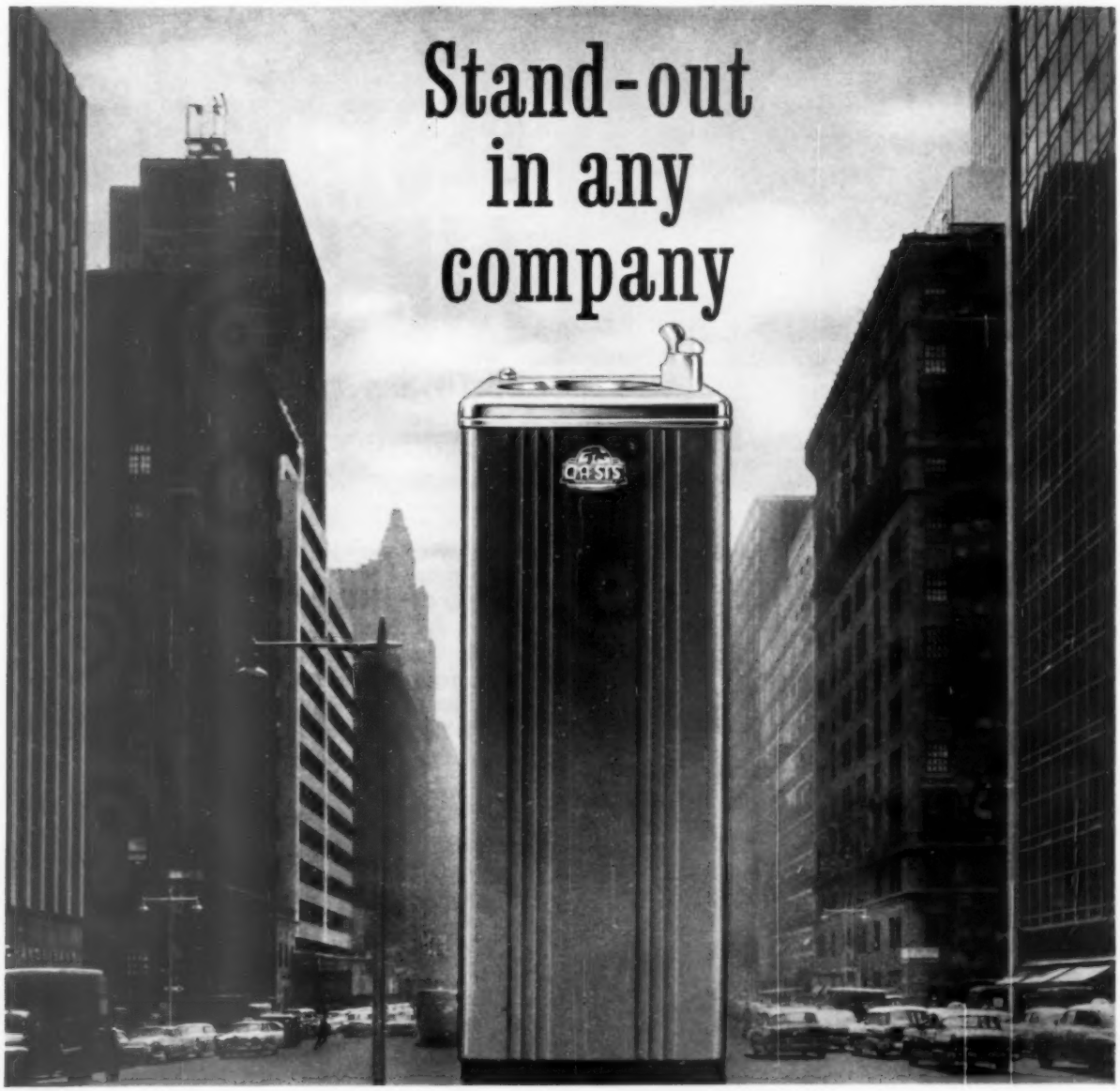

In a class by itself, a cut above the ordinary, an Oasis Water Cooler always stands apart . . . trim, capable, quieter running. Its very appearance bespeaks the quality within . . . the specialized craftsmanship with which it is designed and built. Full 5-year warranty on all parts attests to its superior manufacture and dependability. Small wonder Oasis Water Coolers serve more offices and factories than any other kind. Choose from 19 distinctive models in pressure or bottle-types . . . Standard or Hot 'n Cold. Write for free, illustrated booklet.

oasis

America's Preferred

WATER COOLERS

BY THE EBCO MANUFACTURING COMPANY

rented or sold everywhere

THE EBCO MANUFACTURING COMPANY
Dept. 6-W, Columbus 13, Ohio

Please rush me free booklet on Oasis Water Coolers.

name_____

company_____

street_____

city_____ zone_____ state_____

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BEST BUY FOR AIR SUPPLY

UP TO 5hp... NEW WORTHINGTON MONOBLOC X-COMPRESSOR

Based on purchase price, on extremely long compressor life . . . and on safety, too . . . your best buy for a 1½- to 5-h.p. air supply is the new Worthington MONOBLOC X-Compressor.

First, the MONOBLOC saves you $30 or more for parts and labor because it comes completely wired. There's no starting switch to buy and install and wire in.

It's more economical, too, because all your money goes to buying a quality motor, compressor, controls and tank. You don't waste it on unnecessary belts, belt-guard, sheaves, long base and on the labor required for assembling them.

Is floor space important to you? The MONOBLOC vertical tanks save over 60% of space required by old-style horizontal units. A 10" radius circle for the 60-gal. tank; a 12" radius circle for the 80-gal. tank.

The MONOBLOC costs less to run. All power goes to the compressor—no power loss in belt friction. (No belt guards or belt replacements.)

Of course, you want long compressor life. The MONOBLOC is built with the new Worthington X-Compressor design that virtually eliminates harmful vibration. The wide-stance X-shape design reduces vibration to the point where a coin can be balanced on the unit during starting, running and stopping.

A silicon-treated filter element removes over 99% of the dirt from incoming air—the most dangerous source of compressor wear. Tapered roller bearings cut friction. The large lubricating oil sump permits better cooling, less danger from low oil supply. These and other design features assure extremely long compressor life.

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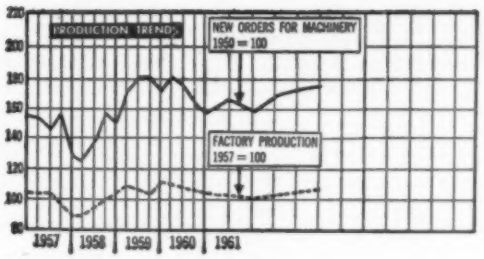
LOOKING AHEAD IN BUSINESS

A FACTORY PRESS TIME REPORT

Indicator	MAY[p] 1961	APRIL[r] 1961	MAY 1960
New Orders for Machinery (exc. elec.)[1]	175.0	173.0	189.0
Contracts for Industrial Construction[2]	127.0	133.0	141.0
Factory Production[3]	108.0	105.0	110.0
Consumers' Prices (cost of living)[4]	127.5	127.5	126.3
Industrial Prices (materials, supplies)[4]	127.8	128.0	128.2
Manufacturing Employment (millions)[4]	15.9	15.7	16.5
Total Employment (millions)[5]	66.8	65.7	67.2
Unemployment (millions)[5]	4.8	5.5	3.5

p = preliminary r = revised



Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board 1957 = 100); 4. U. S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Dept. of Labor, Bureau of Labor Statistics.

With summer—a bright view

THE OUTLOOK | **Though unemployment and housing still nag the nation's good cheer, businessmen are encouraged. Plant production is up. Profits should follow. Next move: bigger investment plans for 1962.**

Business news gets better and better as we move deeper into the second half of 1961. Since the recession's low at the beginning of the year, industrial output has risen determinedly upward to record levels—10% or better. It will rise even more in coming months.

One strong supporting factor, federal spending (on defense and welfare), is now matched almost dollar for dollar by state and local spending. Both public sectors are well ahead of a year ago. For 1961 as a whole they'll spend 7% more than in 1960.

The stage is set for revival in corporate profits, hard hit by the recession. Third-quarter profits may turn out to be as much as 25% above profits earned in recession months, and will keep on going up later this year. Despite 1961's poor showing through March, annual profits are expected to average close to last year's $44.3-billion. They may even go as high as the record level of $46.6-billion reached in 1959. Aiding the profit picture is increased plant activity with all plants approaching 85% of capacity.

Businessmen are feeling a fresh confidence contrasted with July 1960. The recession turned out to be short and shallow; confidence in the strength of the dollar is restored. U. S. exports to foreign markets are strong, and domestic markets are being won back from foreign competition. Quality for quality, we are not being priced out of world markets.

Consumers are showing a willingness—if not great enthusiasm—for buying. So far, they're spending $10-billion more than last summer, with auto sales pacing the demand for durable goods. Having reduced their debts, consumers are in a good position to boost retail sales also in coming months. The September rise in minimum wages to $1.15 an hour could start a chain reaction in spending by low-income groups.

Refreshing as this news is, problems hang on. Unemployment remains high—close to the 6.9% figure (seasonally adjusted) of March. The next few months are expected to show only a slight improvement. At best, job openings will do little more than absorb the increase in numbers of workers entering the job market. The backlog of unemployment will not be affected greatly. The outlook for improvement in housing starts is still uncertain.

The combination of plentiful capacity and relatively high employment suggests that recovery may be accompanied by stable prices. Price cuts are already appearing, despite rising volume. Some experts say the economy may be entering the first strong buyer's market of the postwar period.

On the whole, good prospects now outweigh the gloomy and uncertain ones. And as good news accumulates, the combination of higher profits and strong consumer demand could raise the level of investment already being planned for 1962.

WASHINGTON WIRE

A FACTORY PRESS TIME REPORT

PINPOINTING YOUR STAKE IN WASHINGTON THROUGH INSIDE REPORTS ON AFFAIRS VITAL TO PLANT MANAGEMENT.

Plant men will get some help in disposing of obsolete machine tools. At least, that's one result hoped for in the President's foreign aid program. A $5-million revolving fund would allow the International Cooperation Administration (ICA) to buy up and refurbish surplus machine tools for release to nations receiving ICA aid. Officials estimate the current demand at 50,000. Planners hope the "tool bank" idea will give U. S. industry a chance to modernize its equipment more rapidly.

Heavy adverse reaction to latest in-plant anti-discrimination rules will not deter their enforcement. Opposition was expected by the President's Fair Employment Practices Commission. But it was so heavy that the FEPC chairman (Vice President Lyndon B. Johnson) had to schedule extra hearings. Undaunted, FEPC will put the rules into effect late this summer. Generally, it bans job bias on federal contracts over $5000. The commission's successful agreement with Lockheed at Marietta, Ga. (W/W, June), spurred it to reject criticism and opposition.

One Washington source says: "Any tax credit plan Congress passes this year will be little more than a stop-gap measure." It's agreed that over-all tax reform is urgently needed. "But," says our source, "neither the administration nor the committees studying it see it before next year." Then companies and individuals may get tax cuts. But only if level of business warrants it.

► **A 7% across-the-board tax credit plan for spending on new plant and equipment gains momentum in Congress and the Treasury.** It would substitute for the administration's tax credit proposal, which drew strong opposition from business (see W/W, May and June). The new plan would allow a company to subtract from its annual tax bill 7% of the amount it spent the same year on new plant and equipment.

Insiders say President Kennedy would accept the plan, since it should cost the Treasury about the same as his own plan—$1.7-billion a year. But the White House will clash with Congress if (as expected) Congress also rejects the other parts of the administration's tax package. These would tighten tax rules on overseas profits, put a withholding tax on dividends, repeal the 4% on dividend credit, and tighten rules on business expense deductions. The President insists these measures are needed to offset the revenue lost through tax credit.

Resolving the confusion in federal conflict-of-interest laws is the near-impossible task taken on by the House anti-trust subcommittee. Vaguenesses and contradictions abound in the present conglomeration of statutes. This is demonstrated by the various ways Senate subcommittees have viewed stockholdings of nominees for government jobs. Chances of passage for any one of four bills before the subcommittee are pretty slim. But two of them—identical—may have some chance next year. Sponsored by Rep. Emanuel Celler (D-N.Y.) and Rep. John V. Lindsay (R-N.Y.), they would clarify and codify current criminal laws banning conflict of interest.

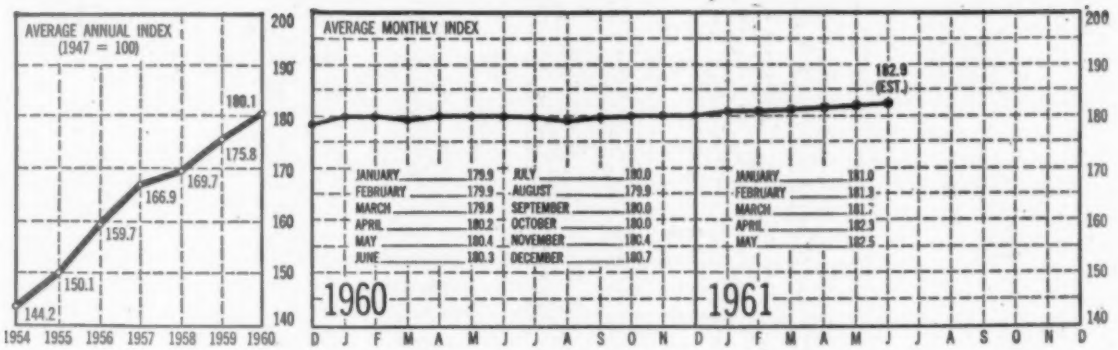
A bill to broaden anti-trust investigative powers of the Justice Department may pass Congress this year. Introduced before without success, it now has full support of the President.

Briefly, the bill would permit Justice to subpoena company records while investigating a *civil* complaint. Currently, it has such authority only in a *criminal* anti-trust complaint before a grand jury. Critics say the measure would give Justice the right to enter company records on "fishing expeditions." Precedent resides with the Federal Trade Commission. It already has authority to demand information similar to what the bill would give to Justice.

Federal loan-insurance help for middle-sized plant and equipment modernization was rejected by the White House—at least for the time being. Assistant Commerce Secretary Hickman Price Jr. floated the idea as a trial balloon. It would provide insurance-loans for firms not eligible for small-business aid. Plan would resemble FHA program for homeowners. The proposal got no support from other federal agencies. So the balloon was reeled in for more air.

COST INDEX OF PLANT MAINTENANCE

A FACTORY PRESS TIME REPORT



Modest increase follows trend

	AVERAGE 1960	MAY (Preliminary)	APRIL (Revised)
Building and Facilities Index	170.6	174.1	197.4
Materials	140.1	138.8	138.5
Brick	154.9	155.2	155.2
Elec. fixtures	131.9	130.9	130.9
Elec. switches, boards, fuses	183.3	182.5	182.5
Elec. wire, copper	147.0	138.9	135.6
Glass	148.1	147.7	147.7
Gutters, spouts, ducts	180.3	180.4	180.4
Gypsum products	140.9	142.7	142.7
Heating equipment	125.5	121.1	121.1
Lumber	128.7	123.4	123.4
Millwork	156.7	154.1	154.1
Paint	130.2	134.0	134.0
Pipe, cast iron	170.4	170.4	170.4
Pipe, steel	190.7	188.7	188.7
Pipe & tubing, copper	151.5	113.3	109.0
Roofing	113.9	121.3	121.3
Sanitary fixtures	162.4	161.8	161.8
Sash, metal frame trim	137.4	136.9	136.9
Solder	122.5	131.1	128.7
Steel, structural	236.3	236.3	236.3
Tanks, steel	139.6	138.4	138.4
Valves & fittings	167.8	163.7	163.7
Wire mesh	163.8	162.9	162.9
Labor	191.0	197.7	197.4
Carpenters	177.3	183.2	183.2
Electricians	199.4	206.3	205.3
Painters	196.2	203.6	203.6
Equipment Index	184.2	186.1	186.0
Materials	177.6	178.2	178.1
Abrasives	157.9	157.3	157.3
Alloys, non-ferrous	123.2	130.0	125.4
Bars & plate, steel	227.2	227.2	227.2
Bearings	160.0	155.4	155.4
Belting	160.9	166.5	166.5
Bolts, nuts & screws	225.2	236.4	236.4
Chain	187.4	193.8	193.8
Controls (electrical)	183.3	182.5	182.5
Gear-reduction units	181.1	174.5	174.5
Hand tools, mechanics	204.5	207.7	207.7
Lubricants	125.7	125.7	125.7
Motors	145.0	143.2	143.2
Non-ferrous metals	135.8	126.8	126.8
Precision tools	158.2	162.3	161.1
Pumps	235.4	197.3	196.9
Tools, cutting	186.8	184.1	184.2
Valves & fittings	167.8	163.7	163.7
Labor	188.7	191.3	191.3
All mfg. labor	185.1	187.6	187.6
Machine tool labor	192.1	194.9	194.9
FACTORY'S COST INDEX	180.1	182.5	182.3

Gentle upward pressure by both labor and materials prices has pushed FACTORY's Cost Index of Plant Maintenance to higher ground for the fifth consecutive month. But the jump was hardly a hop—from 182.3 in April to 182.5 in May.

Materials costs in both major categories of the Index were higher. In the equipment component, non-ferrous alloys led the march—up 4.6 points. Precision tools were up 1.2 points, and pumps 0.4. Cutting tools were down 0.1. Even with these price hikes, total materials costs for equipment maintenance were only 0.2 higher than in January of this year.

In the building and facilities component of the Index the story is the same. Costs have risen just 0.2 since the first of the year. There were only a few scattered increases in May. Solder was higher by 2.4 points. Copper pipe and tubing was up 4.3 points. Copper wire rose 3.3 points.

During the months ahead, a few scattered price rises can be expected. But no strong upsurge seems likely. Despite the steel industry's lament about price weakness, no general cuts in prices of materials can be expected. Though steel is an important commodity in an industrial society, its woes are by no means typical of the general price situation.

Labor costs moved upward again in May, but with slightly less vigor than in previous months. Electricians' costs in the building and facilities sector of the Index were higher.

In the equipment index labor costs are now 1.9 points higher than at the beginning of the year. And in the building and facilities component they're 3.5 points higher.

The labor cost outlook for the rest of this summer seems quite certain: only modest gains. Looking beyond that is more difficult. Labor negotiations later this year will set the tone for future wage changes. And the rate of business recovery may determine how hard management resists new wage demands.

LOOKING AHEAD IN LABOR

A FACTORY PRESS TIME REPORT

JFK asks action on unemployed

Can the unskilled or under-skilled factory worker be retrained for the automated factory? If so, will there be jobs ready to be filled? The Kennedy administration gives a precarious "yes" to both questions—without actually knowing for sure that it's the right answer. The evidence at this point is to the contrary. Factory jobs are fast disappearing in the face of automation. The skills demanded in existing jobs are beyond the talents of employees.

Against this bleak background, the administration's experts propose not only to retrain the jobless worker for the future, but to help him find the job when he's ready. Even though the program is admittedly uncertain in its expectations, officials feel the alternative of no action is worse.

Mr. Kennedy's answer to this problem is the Manpower Development and Training Act. The bill, now before Congress, empowers the Secretary of Labor to seek out the displaced worker, determine the best training method, locate current and future jobs, and, with the employer's help, place him in a position. Tools for the program are federal funds ($700-million over four years), a highly expanded research program, and control over a certain federal, state, and employer training program.

The President's program has three main parts:

- **On-the-job training**—federal funds will be used to encourage employer training programs by providing a share of trainee costs up to $46-a-week maximum for 52 weeks.

- **Vocational training**—the government will match state unemployment payments for trainees assigned to training programs up to a full year.

- **Relocation**—if a job is available for a trained employee in another area, the government will split the cost of moving the worker and his family—provided the employer agrees to hire him.

•

Industrial and vocational training isn't new—but the administration feels the current programs are inadequate to meet the employment problem caused by automation. It believes that (1) these must be considerably expanded and improved, and (2) a single job coordinator, the Secretary of Labor, must combine the training programs to fit workers into modern industry.

The biggest questionmark is this—are the unemployed retrainable? Can vanishing blue-collar workers be fitted into expanding white-collar jobs? Hundreds of thousands of workers in auto, steel, and metalworking plants have permanently lost a place in their industries. Can they be placed in service jobs? New jobs opening up need skills so demanding that one year of training cannot begin to provide the solution.

Mr. Kennedy counters with this plan: For jobs needing highly trained employees, labor and management will be encouraged to step up on-the-job training. For the untrained, the program calls for an extensive study of automation patterns. Its objectives: to learn what jobs are needed today; to predict those that will be offered in one or five years from now; to pinpoint training requirements for these jobs.

Strategists concede this isn't a cure-all for one critical problem that automation raises. That is, some workers, especially among older groups, simply aren't capable of learning new trades. Indeed, the prospects are that the program can successfully handle only 50,000 to 60,000 workers a year. But the planners feel this is at least a start.

What are your views on unemployment? On page 90A FACTORY *gives you a chance to stand up and be counted.*

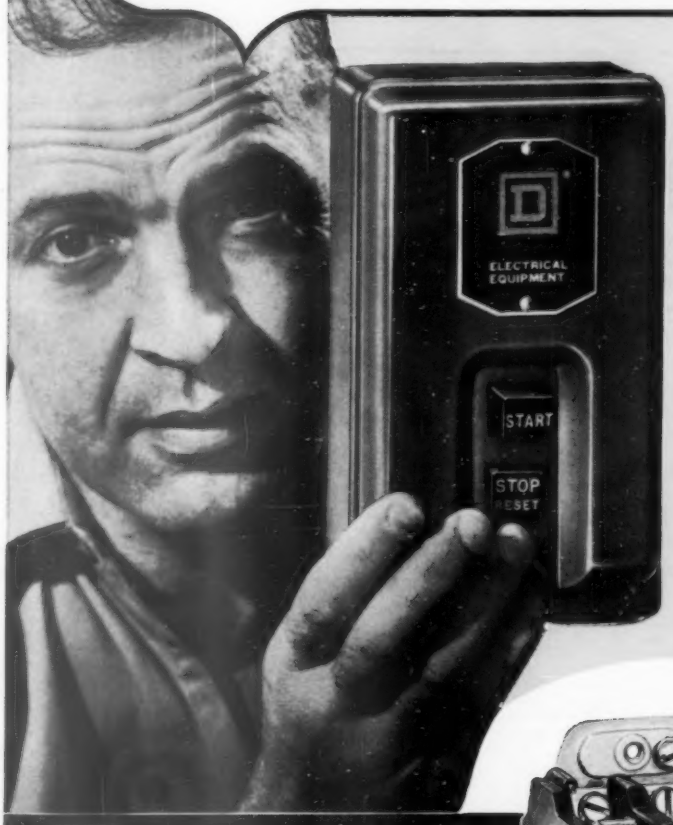
•

Wage settlements so far this year are averaging out as expected—about eight cents. It's the last half of 1961 that worries federal officials who are determined to hold down out-sized wage increases. They cite the pattern so far as "moderate." Key to the future is Walter Reuther's auto workers and their negotiations with the big three auto companies.

The way the August talks look, the White House has made it clear it wants (1) a settlement without a strike and (2) a wage increase that won't force a price hike in automobiles. The strategy is to keep hands off but maintain a close watch. If bargaining appears to be getting out of hand, however, it's almost certain the President will step in.

SEE LABOR RELATIONS NEWS, PAGE 178

This NEW Manual Starter has EVERYTHING!



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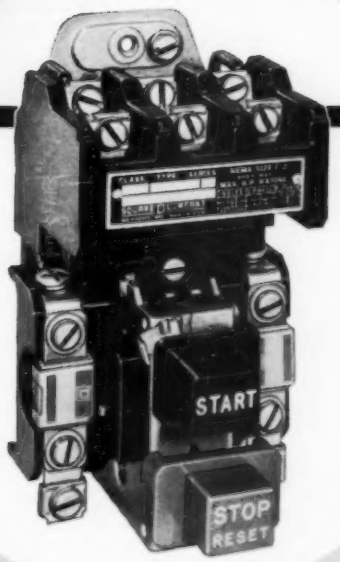
- ***QWIK-MAKE, QWIK-BREAK!*** Positive snap-action opening and closing of contacts. Longer contact life
- ***TRIP-FREE OVERLOAD PROTECTION!*** Impossible for operator to hold motor circuit closed against overload
- ***POSITIVE PROTECTION!*** Starter will not operate *without* overload units installed
- ***LONGER LIFE!*** *Toggle Action* operating mechanism. Heavy-duty construction throughout
- ***EASIER INSTALLATION!*** Wire it without removing starter from enclosure. All terminals have pressure wire connectors



- ***EASIER MAINTENANCE!*** "Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install
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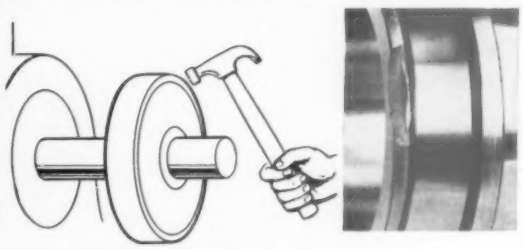
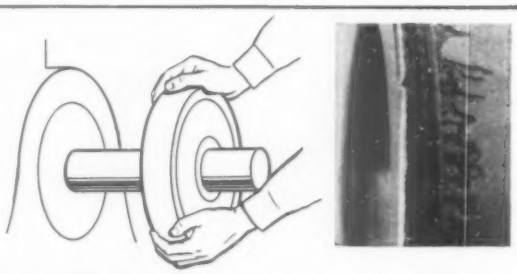
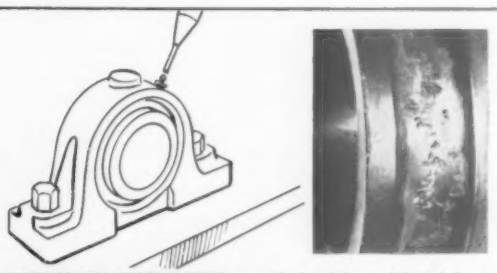


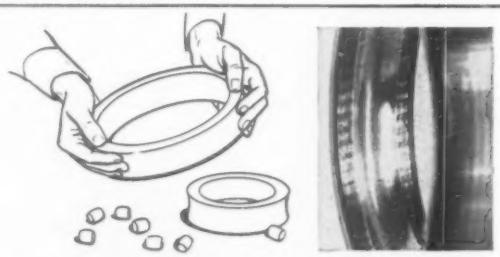
ABUSE DURING MOUNTING. Don't hammer the outer ring of a bearing having an interference fit on the inner ring. Striking the outer ring with a hammer almost always causes denting, brinelling, and even breakage—as shown in the photo at right.



IMPROPER MOUNTING can cause edge-loading and fatigue-flaking, especially in tapered and cylindrical roller bearings. Watch out for off-square mounting or cocking of the inner or outer ring, out-of-line housings or shaft deflection—all of which mean misalignment.



INADEQUATE LUBRICATION results in breakdown of the lubricant by carbonization into a fine abrasive. Heat generated softens the bearing steel and early failure results. So, be sure to give your bearings the right amount of lubricant in the right place at the right time.



DIRT AND OTHER PARTICLES will often cause denting, as shown at right. Even soft particles—brass, aluminum, wood and paper—can dent a rolling surface. Protect your bearings by using effective seals and maintaining cleanliness at all times.

CORROSION CAN START if you wash the bearing in cold solvent and then cover it with a cold slushing compound. The moisture can't evaporate so it expends itself in corroding the steel. To prevent this, immerse the bearing in hot oil or slushing compound and allow it to assume the temperature of the bath.

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Washington is optimistic about "tripartite" labor-management-government committees. Their existence, key men say privately, means industry is maturing, realizing third-party participation in its affairs is inevitable. Is the tripartite working out? Is Washington's optimism really warranted? In this exclusive report FACTORY examines...

PUBLIC CONTROL OF INDUSTRY AFFAIRS: THE ROAD AHEAD

By **LAWRENCE F. MIHLON**, Associate Editor, FACTORY

For American industry to resist the "participation" of government in its affairs is comparable to its resisting the passage of time.

Indeed it is only a matter of time before the inevitable public control becomes a reality, according to extreme members of today's Washington corps.

It is this way because, in the past, labor and management abdicated their responsibilities in dealing with the long-range social problems of this magnificently complex and progressive industrial society.

These are the impressions this reporter drew after a series of recent talks with key officials in Washington and the nation's industry. The talks were aimed at determining the progress of the various groups set up to deal with automation and the problems it spawns.

To dramatize the critical nature of the problem, experts estimate that some 2-million of the nearly 6.5-million now unemployed were displaced by machines. In the years just ahead over 10-million new jobs must be created to handle the addition of new unemployed.

John F. Kennedy drew national attention to such labor-management problems when he formed the President's Labor-Management Advisory Council. In its second meeting, the 21-man tripartite said it considered the present rate of unemployment "intolerable." It promised a study on the central cause of that unemployment—automation. Its supporters insist that the 21-man board will have a definite effect on 1961 auto contract talks—if it can agree on specific recommendations. So far the group is hobbled by generalities.

The President's advisory group is just one of a kind involved in this report. Others are the Labor Department's new Office of Automation and Manpower, Armour & Company's Automation Committee, Kaiser Steel-United Steelworkers Long-Range Committee, and the House Subcommittee on Automation and Unemployment.

Any report on the progress of these groups is a comment on the future of third-party participation in labor-management affairs.

The Labor Department's Office of Automation was created, according to its director, Deputy Assistant Secretary Seymour L. Wolfbein, to act as a coordinator of certain existing department functions, such as manpower planning and training. More specifically, it should in the future: (1) disseminate information of coming events in automation and determine the positive nature of those changes; (2) be a clearing house for case studies

For a searching look at hard-core unemployment, turn back to page 85

Most plant men still reject third-party intrusion into their affairs. This doesn't faze one official. He gives us 20 years to evolve a "social welfare" system.

of company methods for handling automation; (3) extend aid to workers displaced by automation; and (4) take action to prevent adverse impact of change on individuals and areas. Right now this office will act within the framework of operations already legally established for the Labor Department.

Progress here is questionable. Wolfbein, a career civil servant not prone to excess exuberance, calls the response to the aims of the office "overwhelming." But response comes in form of offers from industry potentates to sit on committees and study groups. An advisory committee has been set up. Its 24 members are drawn from government, labor, management, and the academic world. At the board's first session, recommendations were issued that followed, almost to the letter, the objectives of the office as outlined above.

Armour & Company, in a 1959 agreement with the Packinghouse Workers and Meatcutters, set up a $500,000 fund to study the problems of automation and install retraining where needed. The fund committee is a tripartite including four men each from labor and management, an impartial chairman (Clark Kerr, president of the University of California), and an impartial executive director.

Progress here is mildly encouraging. Since the program's institution, an Armour spokesman reports much-improved plant-level labor relations. There have been no wildcat strikes. A retraining program was organized to aid some 400 workers displaced by automation. However, only 170 volunteered to enter testing for retraining. Of these, 58 were retrained—in skills outside the meat-packing industry. The committee executive director questioned the efficacy of "crash" retraining programs set up after the fact.

A more significant task of the Armour Committee: preparation of a progress report for use in August, 1961 contract talks. Its effect on bargaining is considered the real test for any tripartite.

The outlook is dismal. Signs of cooperation in talking stages died when the report came out. Labor and company men split sharply on traditional issues. Maneuvering for bargaining advantage delayed release of the report. Preliminary contract talks indicate the union has not lessened its demands.

At Kaiser Steel, history of sorts was made two years ago. At the height of the big steel strike, Kaiser announced a separate agreement with the United Steelworkers. Then it unveiled a Long-Range Committee, sporting representatives from labor, management and the public. Its assignment: deal with plant problems informally—before they foul up bargaining.

There is some progress. However, it deals with basic grievance procedures. Automation is not specifically being dealt with. A Kaiser spokesman reports

that intimate relationships have evolved between committee members. Grievances have sharply declined. Since Kaiser is a post-World War II steel power, installation of automated processes have not been a big problem. The very act of growing allows the company to blend manpower needs with method changes.

The House Subcommittee on Automation and Unemployment is perhaps the most significant barometer in determining the future of third-party participation in industry affairs. From this group will come the reports and proposals that may change the legal course of events.

Though denied in public, it is known that the President's automation and unemployment bill, now before Congress, contains provisions lifted from Chairman Elmer J. Holland's (D.Pa.) subcommittee reports.

With its early introduction (by Holland) calculated for political advantage, the White House bill would provide funds for retraining unemployed workers; subsidize them while they're being trained; if necessary, move them to areas where jobs are available.

The Holland report contains only two proposals requiring legislative action: (1) financial aid to unemployed (or employed) willing to train for higher skills—to work something like the old GI Bill; (2) additional federal aid to vocational schools.

Major point of the non-legislative proposals is aimed at the U.S. Employment Service. Congress wants the Service to beef up communications, perhaps set up an

After historic first meeting with President Kennedy, 21-man advisory board has settled down to good cigars and generalities. Seymour L. Wolfbein faces same problem of dealing with well-meaning "industry windbags" offering to aid Labor Department's new automation office. As two key members of Kaiser Long Range Committee, E. F. Kaiser and David McDonald, are showing that an impartial third party can help ease *plant level* grievances.

President Kennedy's Labor-Management Advisory Board.

S. L. Wolfbein, Director, Office of Automation, Manpower.

E. F. Kaiser (l.) company man, David McDonald, labor leader.

early warning system in which manufacturers will be required to forewarn of technological changes.

Capitol Hill insiders say Kennedy's request for federal allowances to cover half the cost of relocating workers doesn't have a chance. Fireworks have already developed among members of the Holland subcommittee.

There are few Congressmen who will go along with financing the exodus of good voters into "another politician's backyard." Besides, they argue, manipulating people like gypsies is counter to the foundations of our family-community centered society.

And so they roll along. Amid fireworks, platitudes, cockeyed optimism, and good cigars, the tripartites roll along. Right now they have no real say in industry affairs. The terribly general generalities being issued by these committees can be taken or left. Government intervention thus far has come only in the form of "the influence of these good offices."

But what about tomorrow?

Key administration officials express confidence in industry's "growing maturity." They say the presence of such men as Watson of IBM, Ford of Ford at the same table with Reuther and Meany of AFL-CIO is evidence of this. Kaiser and Armour add support.

Kennedy men say industry indifference and reluctance to act on the problems of automation, unemployment, and strikes will not be tolerated.

"How can they (management) moan about government intervention when they refuse to accept responsibility in these matters," said one highly placed official.

The man responsible for the Armour tripartite, New York Attorney F. R. Livingston, says few companies are mature enough to benefit from this approach, and that selection of the neutral member requires special care. Armour is his only client with such a plan.

Is industry then capable of going it alone?

Perhaps the most prophetic answer comes from Charles E. Goodell (R.N.Y.), a member of the Holland subcommittee. He insists that the best way to handle things is through an unfettered labor-management community.

But, Goodell suggests, the federal government will probably wind up providing the spark needed to get labor and management to act.

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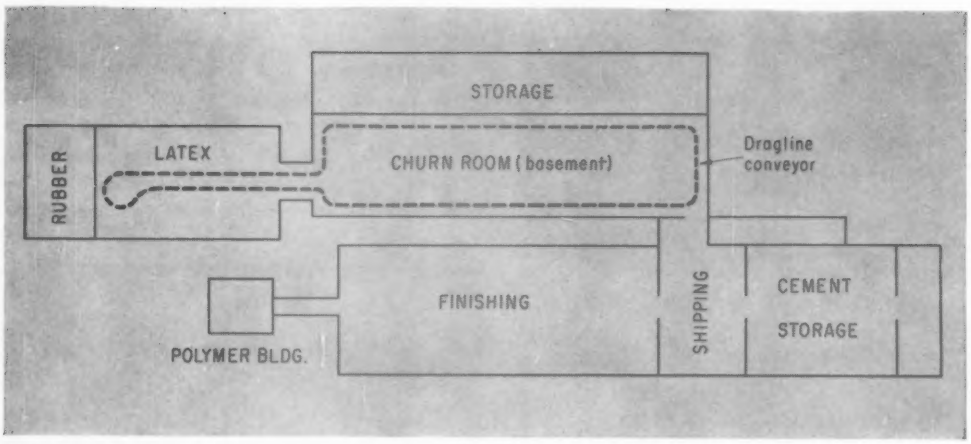


LAYOUT DESIGN provides maximum efficiency and safety. Churn room is key to both. It's in basement, has explosion venting, automatic seal-off doors, floor drain to accommodate flooding with foam or water.

Layout can prevent disaster

If you handle chemicals or volatile fluids, you can't afford to miss this story. Laid out for maximum safety, B. B. Chemical's new plant also provides efficient, direct, and flexible flow of materials.

Chemical plants have unique layout and handling problems. As a leading producer of adhesives, finishes for shoes, and polyurethane coatings for masonry surfaces, B. B. Chemical Company (Middleton, Mass.) is no exception to the rule. Its basic problem? To provide its new plant with a layout plan of operations that would allow efficient flow of materials and, at the same time, offer protection from process hazards. Its solution? To pick the best layout possible and then design a building around it.

To realize the need for a foolproof layout as well as the difficulties involved, you have only to look at the process materials used. Some 20 tanks, located in storage, contain such materials as xylol, toluene, naphthas, alcohols, and low esters. A leak involving any one of these could result in a disastrous fire.

But the layout itself tells the story of safety and efficiency, so let's take a look. Key features are: remote

CENTRAL CONTROL PANEL is on production floor through which volatile fluids are valved and metered to churns. Naphthas and low esters are piped through this panel from storage.

control of enclosed piping system, safe location of churn room, separation of churn room from finishing and shipping, separation of churn room from its motor power, and a dragline conveyor.

As in most plants of this kind, the machinery includes Banbury mixers, rubber mills and shredders, and a bank of churns that are connected by piping to a tank farm, situated a quarter of a mile from the plant. The volatile process materials are piped from storage through a central control panel from which they can be valved and metered to the churns. For additional safety, each batching operation receives its measure of flammable fluids through a completely enclosed system that permits no escape of vapors or liquid.

A 120-cart dragline conveyor circulates continually throughout the entire main-floor area, serving as a feedline for drums, cartons, and palletized supplies. In addition to being a low-cost material handling system, capable of keeping the churns supplied with raw materials for charging, the conveyor serves as a live storage system. The route can be covered in 18 minutes, and the system has sufficient capacity to carry several hours' supplies at any given time while simultaneously hauling away finished goods ready for the shipping and warehouse storage areas.

Perhaps the most unusual feature of the plant is the churn room. This area, with its isolated motor corridor, is situated at basement level and is unique for several reasons. It is divided into compartments that can be quickly and automatically isolated from each other to force containment of any fire. Besides this, the entire pit can be completely flooded in a matter of minutes, or blanketed with carbon dioxide fog within 10 seconds. It is segregated and allows complete ventilation, explosion venting, and convenient accessibility. Finally, all operations, including loading and unloading, can be remotely controlled from one location on the main floor.

Built around this layout, the plant incorporates a broad range of safety features. Floor drains provide normal drainage into the earth and also aid in frequent washing down of churns and the entire pit. With any rupture of piping or other unlikely accident that might result in leakage of volatile fluids, such spillage would be confined to the pit floor, from which it would soon be drained away.

A conjunctive safety feature is the air circulation system. Outside air is taken in, warmed or cooled to 72 F., and held to a constant 50% relative humidity. Air flow is designed to provide 4.2 air changes per hour in the main production area, and this same air is then forced through the churn-room pit at the rate of 18 changes per hour, with exhaust being drawn from ports near the churn-room floor. As a result, an adequately high rate of air change is provided for the pit without unreasonable fuel cost. The air-flow pattern and volumetric distribution can be seen at bottom, right.

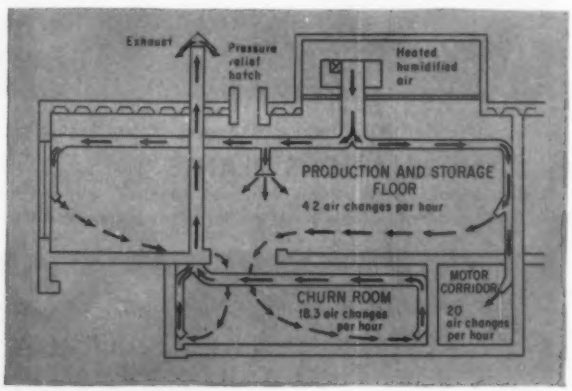
Automatic fire doors also divide the plant's main production and storage areas into four nearly equal parts separated by concrete bulkheads. Thus, in case of a disabling fire—in the finishing section, for instance—it would probably be possible to continue shipping against orders from storage until production facilities could be put back into operation. On the other hand, if the storage area itself were damaged, the chances are good that production facilities would remain unscathed. So again, customer shipments could probably be held to schedule.

Although the completely enclosed system eliminates vapors in the plant (not only a safety feature, but one that realizes savings through loss prevention), extensive precautions against static build-up are also taken. Personnel must wear anti-static clothing, and wrenches and other hand tools are of bronze or other non-sparking metal.

The likelihood of sparks is even further reduced. Compressed air, available throughout the building, powers all maintenance tools and portable production equipment. The plant's electrical system also utilizes explosion-proof wiring and fittings, and to prevent the possibility of an unauthorized tool or appliance being plugged in, it has special outlets that will not accept a standard plug. Even the telephones in the plant are of the explosion-proof type.

All in all, B. B. Chemical is a model of safety and efficiency. It's a demonstration of what you can do by designing a layout and building to meet your problems.

MOTOR CORRIDOR and churn-room pit occupy entire basement level. Motors drive churns located beyond bulkhead at right. Only churns' drum shafts extend through the wall.



AIR CIRCULATION system operates as integral part of plant's heating and humidifying equipment. This allows high rate of air change for pit without an unreasonable fuel cost.

GOV. JOHN A. VOLPE of Massachusetts keynoted award ceremonies. He praised winners for business foresight.

CELEBRATORS wined and dined at Park Avenue's fashionable Hotel Pierre. Executives from Ten Top plants came from all over country to receive congratulations sent by Secretary of Commerce Luther B. Hodges and others for their achievements.

HONORING THE WINNERS

of FACTORY'S 1961 Top Ten Plants Competition

Executives and key plant people were feted by FACTORY editors on May 17. Winners included American Sugar Refining Co., CBS Electronics, and Clevite Transistor plants in Mass.; Pako Corp., Minn., Chicago Aerial Industries, Inc., Ill.; and Rose Marie Reid, Calif. Plants received handsomely framed original watercolors.

Editor-in-Chief Les Bittel congratulates winners from . . .

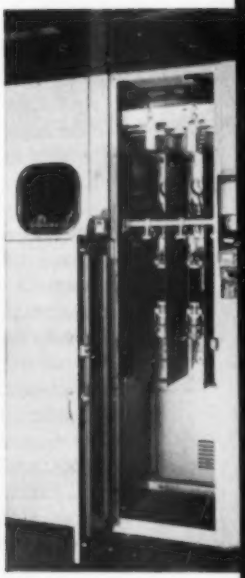
. . . BIG PLANTS like $27-million Owens-Corning Fiberglas Corp., S.C. Plant Manager C. R. MacPherson is joined by heads of engineering, architectural, and construction firms.

. . . SMALL PLANTS like Aeronautical Electronics' (N.C.) $220,000 plant. Company President C. R. Browning typifies executives' desire to improve plant production facilities.

. . . HARD GOODS PLANTS like Robertshaw-Fulton Controls Co., Pa. Frank Post, vice president, spearheaded multi-million-dollar building program that gave company a winner.

. . . SOFT GOODS PLANTS like Hanes Hosiery Mills, N.C. Chairman of the Board R. B. Crawford was among 100 executives who were honored at nationally publicized dinner.

BREAKERS in metal-clad switchgear give an industrial plant the utmost in safety, durability, and flexibility in switching and fault protection. But they demand regular maintenance and they cost more.



FUSES and interrupter switches are now moving into industrial systems after over two decades of wide use in utility distribution.

Can fuses replace breakers?

Plant power distribution methods are changing. Fused switches can save you thousands of dollars over circuit breakers. But they could handicap you, too. Here's how to evaluate them.

FOR PLANT MANAGEMENT accustomed to swift changes in production methods or labor relations, the slower changes in plant power distribution equipment may go unnoticed. The power system for a plant built or modernized in 1961 *looks* pretty much like a system built into a 1951 plant.

But important changes *are* taking place. More electrical capacity and flexibility per square foot are being put into today's plants. More of the modernization or construction dollar is going into electrical equipment. (Figures as high as 15% of construction costs or 50% of modernization costs aren't unusual.)

To provide capacity for growth and changes, plant engineers and consultants have been cutting corners and eliminating unnecessary features in electrical systems. Many have begun using metal-enclosed high-voltage fused interrupter switches in place of metal-clad circuit breakers. Reason: They offer nearly the same short-circuit protection at one-third to two-thirds the cost. Fused equipment will often cut $20,000 off an electrical contract that totals $100,000.

Based on interviews with users and manufacturers of fused interrupters and circuit breaker switchgear. By G. C. Quinn, FACTORY's Electrical Editor.

Management can't afford to toss this kind of a decision solely to outsiders or to the plant electrical staff. There's too much money involved. And the type of equipment chosen has a direct bearing on the operation of the plant.

Price isn't the only factor that has boosted recent acceptance of fused switchgear. Equipment manufacturers have made important improvements. Ratings have been extended, until there are few industrial systems beyond the capacity of available fuses. Experience, while not all favorable, is showing conclusively that properly applied fused gear, properly operated, is entirely satisfactory today.

Sales figures are hard to come by, but some experts FACTORY talked to estimated that from 10% to 15% of the switchgear dollar was now going into fused inter-

"Plant engineers, consultants, and even our own salesmen often do not fairly present both sides in the circuit-breaker/fused-switch controversy when they're talking to plant management..."

(A manufacturer who makes both)

rupter equipment. Figuring two averaged fused units for the price of one circuit breaker means that perhaps one out of every five cubicles being made today encloses fuses and a switch.

Equipment manufacturers' policies have changed. In the past, the bigger manufacturers spent almost their entire efforts in selling the protection and flexibility of metal-clad circuit-breaker switchgear. When required, they either purchased fused interrupter assemblies or components, or offered their own designs admittedly half-heartedly. Ten years ago, only two manufacturers, S & C Electric Company (Chicago) and I-T-E Circuit Breaker Company (Greensburg, Pa.), manufactured and aggressively promoted the concept of fused gear. Today, General Electric, Westinghouse, Allis-Chalmers, Federal Pacific, and others are all offering new fused interrupters, some designed with the "drawout" feature, which had been an exclusive safety and convenience advantage of circuit breakers. (Fuses and switch are thus removed from the cubicle before maintenance.)

Fused interrupters still suffer from several handicaps. Early misapplications and flaws in fused interrupter gear left many plant operating people, circuit designers, and application engineers afraid of it. Published literature on industrial power systems frequently ignored fused gear. Designers say standard specifications available for fused gear are generally "loaded" in favor of one type of design. And they find it hard to draw up specifications that enable suppliers to offer a choice of either circuit breaker or fused interrupter gear.

The differences between the two types of circuit protection show up in the restrictions in applications, economics, and safety. Inherent equipment limitations or circuit peculiarities may simplify your choice by quickly eliminating one of the alternatives. Here are the factors you need to consider:

COMPARING APPLICATIONS

"If you have an electrical system where electrical faults occur regularly and switching goes on all the time, fused interrupters are the wrong way to save money . . ."

(An electrical engineer for a large electronics manufacturer)

Metal-clad air circuit breakers are available for voltages from 2.3 to 15 kv., continuous ratings to 3000 amp., and interrupting ratings to 1,500,000 kva. Fused gear in the same voltage range will handle up to 600 amp. and 780,000 kva.

In metal-clad circuit-breaker switchgear the high-voltage bus is completely insulated. All high-voltage portions are isolated by metal barriers. The circuit breaker is closed electrically and held closed by a solenoid latch that can be tripped locally or remotely, manually or automatically. Metering and relaying facilities are standard equipment.

Metal-enclosed fused interrupter gear normally uses open, porcelain-mounted bus construction, open cartridge fuses, and an open three-pole switch driven by a spring-loaded fast closing and opening mechanism. To operate it, a man-size handle must be swung through a 4- or 5-ft. arc. Metering or auxiliary equipment is extra.

Fuses are either boric acid (expulsion) or current-limiting type. Action, characteristics, and dimensions of the two are quite different and they are seldom interchangeable. In the former, the fuse element is surrounded by boric acid powder and held under spring tension. When the fuse melts, the resultant arc releases the water vapor in the boric acid, expelling it in a cloud of incandescent steam from the end of the fuse cartridge. On smaller ratings, a condenser or baffle on the end of the fuse reduces noise and discharge flash. However, when the larger fuses interrupt full fault currents, the noise is loud enough to scare the wits out of anyone nearby. Cubicles using expulsion fuses must be designed to withstand the pressure build-up at time of discharge. Boric acid fuses are available from ½ to 400 amp., their interrupting speed is slower (½ to 2 cycles), hence more predictable. The fuse element can be renewed several times.

The typical current-limiting fuse consists of numerous strands of fine silver wire surrounded by silica sand. As the fuse wire melts, the silver vapor is cooled by the sand before fault current can reach full value. Current-limiting fuses emit no noise and they always interrupt major faults within a half cycle. (Consequently, it's difficult to predict which of any fuses in series will blow first.) They frequently cost more, are not renewable, and can only be used where load is equivalent to about 200 amp. or less (at 13.8 kv.).

Fuses are designed to protect against short circuits—not overloads. A fuse will blow quickly when current is 10 or 20 times the fuse rating, but it may require several minutes to melt at two or three times normal current. In this "gray" area between about 200% and 500% of full load, fuse time lag is so great that an operator could conceivably interrupt an overload with the switch. (For instance, if he closed in on an overloaded motor or a high resistance fault, realized that something was wrong, then reacted by opening the switch.) Most modern interrupter switches are designed to open full rated load current, and to close safely against any current the fuse will interrupt. But they cannot interrupt serious overloads without damage and possible operator hazards.

Because most industrial outages are caused by major faults (such as cable failure) there are not many industrial distribution circuits where the 200% to 500% type of overload needs to be considered. But where these exist, fused gear is at a serious disadvantage. Some newer switch equipment includes a safety time delay to prevent the operator from opening the switch until several seconds after closing.

Circuit breakers are free from any of these limitations. The only effect of closing against or opening any load up to the full interrupting rating is increased contact wear.

In some circuits, coordinating interrupting time when fuses are in series with each other or with circuit breakers is often so difficult that fuses cannot be used. On a major fault all fuses in the current path try to blow, instead of just the one nearest the fault. Under moderate faults, fuse operating time may vary because of ambient temperatures or previous load levels. Sometimes the only satisfactory way to protect equipment against overloads when using fused gear is to supply fuses through a main circuit breaker that's set to trip on overloads, but not on faults—except those that could occur within the switchgear.

On the other hand, it is a relatively simple process to coordinate relay settings of circuit breakers even when connected in series through three or more levels in the plant power system, so that only the one nearest any fault will open.

These limitations often make it difficult to rely on fused interrupters to protect the larger ratings of load center substations when they're supplied from a feeder that is protected at its source with a circuit breaker. The fuse has to be so large (to withstand surges) that it will probably open more slowly than the breaker on the normal substation fault.

Both fused and circuit-breaker gear are available in indoor and outdoor construction. However, at present only breaker equipment is available with prefabricated built-on sheltered aisle. Several of the experts FACTORY interviewed pointed out that a line-up of cubicles doesn't necessarily have to be an "either-or" proposition. Switchgear assemblies can include both kinds of equipment. Circuit-breaker cubicles can be tailored so they will house fused interrupters (but you'll lose much of the economy). Fuse cubicles can even be redesigned to handle circuit breakers (but you'll lose the safety and reliability advantages of metal-clad construction). Too, within the last few years most makes of fused gear have begun to offer remote electrical, pneumatic, or hydraulic switch operation. As these kinds of features are added to fused gear, it loses much of the price advantage it enjoys over circuit-breaker equipment.

Switch wear and the inconvenience of manual operation rule out fused interrupters where operation is frequent (as in arc furnace switching or in most motor starting service). The typical 600-amp. switch is designed to withstand 100 operations at full load before parts need to be replaced. Circuit breakers handle from 2500 to 5000 full load operations before wear forces parts replacement.

The other handicap inherent in fused circuit protection shows up in those faults where only one fuse blows, and single-phase power continues to flow to the load through the remaining two fuses. (This assumes that no one is aware of the fault or opens the switch.) Under the right conditions this can cause motors fed from any substation protected by fused gear to stall and burn out. Where this is possible, the only alternatives are to use circuit breakers, or to place overload relays in all three phases (instead of two) in all motor starters feeding critical or expensive motors. This offsets some of the initial investment advantages of fused gear. But it also closes up a weak spot in motor protection equipment that makes sense, even when high-voltage fuses are not involved.

Flexibility for future changes and expansion of your electrical system ought to be considered in your choice of protective and switching equipment. Circuit-breaker gear has many advantages here. It's a simple matter to add remote operation to one or more breakers in a line-up. Or if one key load center substation supplies a part of the plant where downtime can't be tolerated, an extra breaker and feeder cable can be run to the critical load and a few new relays mounted on the cubicle panels. From that point on any feeder failure automatically throws the load on the spare feeder within a few cycles, if desired.

Some of these features can be added to interrupter gear, but it presents problems. For one, the price advantage over breakers starts to disappear. "Installing fused equipment is like buying an economy car—it doesn't pay to do it if you expect to hang a lot of extras on it later." This was the advice of the electrical systems designer who has installed lots of both fuses and breakers in plants all over the country. Remote operation of many designs of switches calls for an extra cubicle. And transfer switching can't be done at speeds approaching breakers. If large synchronous motor loads are present, fast transfer switching may not be possible at all.

COMPARING ECONOMICS

Fused gear may save you $3000 for each cubicle in the switchgear line-up. But every future fault will cost you money for fuses and will probably mean more downtime.

A quick price comparison shows why fused interrupters are so attractive when initial investment must be kept down. Take a typical metal-clad switchgear layout of five cubicles, indoor construction, 13.8 kv. The first cubicle contains a 250,000-kva. main breaker fed from the main transformer or the utility lines. The other four cubicles each contain a 250,000-kva. feeder breaker, plus standard auxiliary equipment. List price for this line-up is about $27,000 in metal-clad circuit-breaker switchgear.

A user can get almost equivalent short-circuit protection from a comparable line-up of one 1200-amp. and four 600-amp. fused switches. The price? Approximately $10,000.

And low first cost isn't the only saving. The metal-clad line-up will be roughly 15 feet long, 7 feet deep, and weigh about 15,000 pounds. The line-up of fused interrupters will probably be the same length, but only

5 feet deep and 10,000 pounds. (The fused gear may be a foot or more higher.) When "drawout" construction is not required, fused gear can be squeezed into a narrow aisle or balcony because the only clearance necessary is for the door. In some fuse designs no clearance is needed behind the cubicle. Metal-clad gear generally needs substantially more room (and a smooth, level floor) in front of the cubicle to maneuver the drawout circuit breakers in and out.

In addition to a lower first cost with fused switches, you can expect faster delivery. You will also save time and money during either outdoor or indoor installations. Hook-up time is less for fused units, because buswork is left uninsulated.

But first cost isn't the only cost. Replacement fuses or fuse inserts cost from $10 to $200 each, plus labor, whereas a tripped circuit breaker costs nothing. Though there's some argument about the need for it, many users replace all three fuses following a fault, regardless of whether they all blew or not. One plant engineer told of cutting apart one of three fuses that had been through a fault, but which tested okay. He found half the fuse element melted away.

Replacement fuses to match each rating and kind of fuse in your line-up must be available in your plant. Fuse manufacturers point out how many air express shipments they have to make because customers fail to keep adequate spares on hand. Often the crisis comes when an uncorrected fault causes two or more fuse operations in a row.

Although most fuse operation takes place when equipment is initially energized, subsequent fuse blowing seems to occur in cycles. And any plant manager who has been through a siege of "when trouble rains, it pours," has vivid memories of the crisis. Faults on a high-voltage circuit can be difficult to find and frustrating to correct, especially when the pressure is on to get equipment back in production. For instance, if the fault is caused by a flashover due to contamination build-up on an insulator, the crack in the insulator surface left by the fault may go unnoticed in a hurried inspection. Or the accident in which a crane shorts out overhead cables may cause concealed damage to insulation that will live long enough to cause another fuse operation a few hours (or rainstorms) later. Few plants are equipped with the kind of portable test equipment that will spot incipient trouble before re-energizing a high-voltage circuit. And even the best test sets can't predict the effect of future heat and mechanical stress.

So the usual procedure following a fault is to make a careful inspection of the cable, insulators, and connected apparatus, repair any visible damage, replace the fuses, energize the circuit, and hope for the best. With fuses a second blow can bring the total cost of the failure up to several hundred dollars with no assurance that more expense isn't on the way.

With circuit breakers protecting the equipment, the only cost is a recommended examination of the contacts whenever a full fault is interrupted.

COMPARING SAFETY

Both circuit breakers and fuses are completely safe when they're applied and used normally. Breakers become unreliable if routine maintenance is neglected. Fused switches become a real hazard if you have careless electricians.

Both types of modern metal-enclosed switchgear are free from the normal hazards that cause accidents in older open-type switching and protection methods. Safety interlocking, plus rigidly enforced safety rules, can keep operation and maintenance of high-voltage equipment safe. Undoubtedly, the completely insulated bus in circuit-breaker cubicles, plus full metal barriers between the operator and high-voltage components, does offer greater safety to the careless maintenance man, but this kind of an employee can always find some way to defeat any safety device.

No equipment is safe if it isn't maintained properly, and the more complex the device, the more important it is that preventive maintenance be performed consistently and carefully. Circuit breakers, for all their durability and dependability are woefully neglected in some plants. (One insurance inspector told FACTORY he estimated that a third of the breakers in industry would fail if they were called on to interrupt a full fault —maintenance is so poor!) Mechanisms are allowed to wear, conductive dusts seep into contacts that can't be completely insulated and, most of all, relay settings get out of adjustment (they need to be checked every year).

If dust isn't a problem, and switching is infrequent, fused interrupters can go years without any maintenance. This is one reason they are so popular in commercial buildings and institutions, where electrical maintenance is almost non-existent.

Two safety problems posed by fused gear ought to be considered in any management decision. One is the possibility of opening a switch under overload conditions, before the fuse can blow, but at current levels that could damage the switch and possibly lead to other hazards. The second is the question: What will really happen in your plant when the exact replacement fuse isn't available and production is pressuring the maintenance department to get equipment back on the line once damage is repaired? Would operator safety and the protection of expensive segments of your plant power system be jeopardized by someone substituting larger fuses or even a solid conductor? Any chief electrician can name a half dozen of his friends that got away with practices just as risky.

Unless the concept of safety is firmly entrenched in the plant operating staff, there's always a temptation to bypass protective equipment. This is especially true when it can be done conveniently—and if the successful derring-do makes heroes out of the electrical staff when the motors start to turn again.

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Production gets...
A crystal ball that works

Here's a new technique that permits you to spot trouble a mile off, and helps you decide what must be done, in what order, and by whom, to head it off. It's simple, it's cheap, and it's reliable. Dozens of companies swear by it.

Officially, it's called Line of Balance. This new technique was developed by the Navy to monitor progress on defense projects. At a glance—and with one sheet of paper—it tells whether or not equipment will be delivered on time. If things aren't on time, it shows where the bottlenecks are, and gives a pretty good idea of when delivery can be expected. More important, it also tells where the *future* bottlenecks will be, so you can take steps to get things back on the track. It helps you focus your attention where it counts, instead of having you gallop off in all directions.

Line of Balance is based on the idea of management by exception. It deals with only the main checkpoints of the project, or those that potentially govern the overall schedule. It's a monitoring and reporting technique, rather than a control system. (A good control system has to take *everything* into account.

Essentially, Line of Balance measures where a project *is* with respect to where it *ought* to be. It shows you current status in terms of planned objectives. If anyone down the line tends to put off the day of reckoning by editing his reports for best appearance, Line of Balance will keep him honest. It reduces paperwork and shows how well your various phases of manufacture are synchronized.

So far, Line of Balance has proven most useful in riding herd on complex production programs, especially on job-shop items. But it can also be used for major one-time projects, like building a plant or making one-of-a-kind products. The Navy even uses it for manpower forecasting and monitoring expenditures, as well as for keeping weapons systems on schedule.

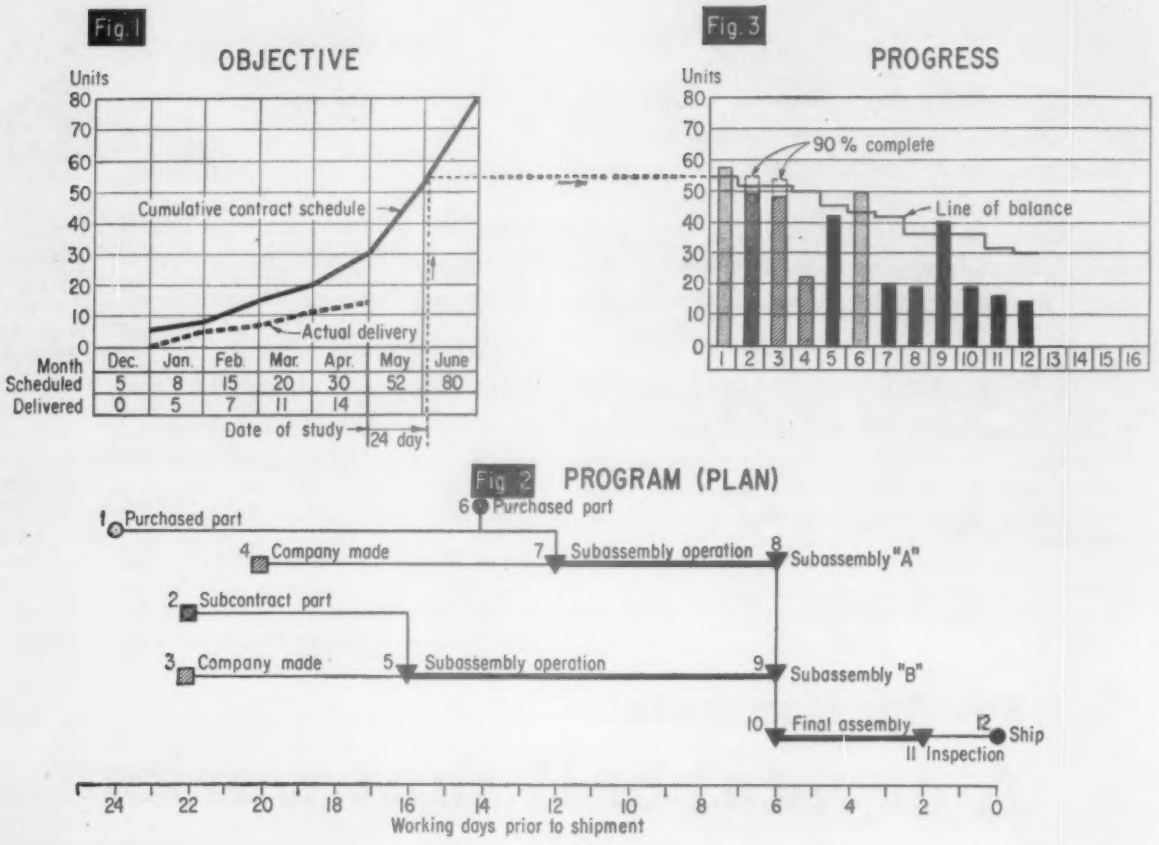
Some companies are so tickled with the way Line of Balance worked on their Navy contracts that they have started to use it on everything they produce. As with any other management tool, your success depends on the understanding and judgment with which you use it.

By ROGER W. CHRISTIAN, Associate Editor, FACTORY

THE LINE-OF-BALANCE STUDY

The first step in using Line of Balance is to make a study; that is, gather and organize the material you'll need into three charts. Once this is done, you can "strike the line of balance" whenever necessary to keep track of things. The three charts are interdependent, and you can normally put them all on one sheet of paper. This not only saves a lot of reading time, but a lot of paper. An aircraft plant once got a six-year forecast on a single set of charts. The same information in written form would have filled a five-drawer filing cabinet.

Line of Balance does not lend itself readily to day-by-day updating, but a monthly or weekly check is



LINE-OF-BALANCE CHARTS work together to give you a preview of future production status, quickly pinpoint trouble spots. Fig. 1 shows final delivery schedule and performance to date; Fig. 2 gives production sequence and timing; Fig. 3 reflects current inventory at check-points—all in terms of end-item units. Text tell how to find and use the line of balance.

. . . PRODUCTION'S CRYSTAL BALL

usually enough to keep things on schedule. If the project really caves in, and you just can't ship on schedule, at least you'll know it—and know why—far in advance, so you can adjust smoothly. And reporting to your customer (or top management) is quick, cheap, and graphic. The charts you use for analysis and trouble shooting double as newspapers, for at-a-glance reporting of how things are doing. A set of clean, simple charts is a lot easier to digest than a dreary list of facts and figures. And charts are faster and more reliable than oral reports.

A Line-of-Balance study has four elements: (1) the objectives of the project; (2) the plan and a schedule for achieving it; (3) the current status; and (4) a comparison between where you are and where you're supposed to be.

The first phase of the study is to set down the objective. Typically, this is the contract delivery schedule. The number of end items required per unit of time is plotted (see Fig. 1). Include any end items that may have already been shipped before the study. Actual and planned deliveries are both put on the same chart. In Fig. 1, for example, the schedule calls for 5 end-items in December, 3 more in January, 7 in February, etc. But we've only shipped 5 in January, 2 a month later, and so on. (All entries are cumulative.)

We're off and running with just this one chart. The horizontal difference between the two curves shows just how far we're off in terms of time. The vertical difference tells us how many *items* are overdue. Slopes of the curves indicate the lag in the production rate.

The second phase—and the most difficult—is to set down the program itself; the steps by which the project will be accomplished, and their sequence. Start at the point of shipment and work backwards on a scale of time—working days, weeks, or whatever unit is appropriate. Remember that in a 5-day-week operation, a month is 22 working days. And allow for the time materials are being transferred or stored.

The trick here is to concentrate on the major or limiting steps in the process—the ones that can throw off the whole works. Or, if you prefer, the places where the most money is tied up, or where machine speeds might put a damper on things. These are the important benchmarks that you'll have to keep an eye on. Set down each one in terms of working days of

lead time needed prior to shipment of the final item. These main events are given symbols that show at a glance whether they involve purchased (off the shelf) items, subcontracted (built to order) parts, or pieces and assemblies you produce in your own plant. Assemblies break down into subassemblies, these into parts or operations, and so on (see Fig. 2).

The more steps you decide to monitor, the more sensitive your charts will be, but things also get more complicated. If you decide upon over 50 check-points, you'll probably be better off using subsidiary plans to feed the main one. This way, each chart can be kept simple and easy to follow. And your reporting will also be more on target, with the top men just getting the big picture. The "shipping date" of the subsidiary charts, of course, will be the date on which the sub-project must be ready to plug into the over-all plan.

On the planning chart, each monitored step is numbered (left to right), the step with the longest lead time being No. 1, and the shipping date having the highest number. If two steps are done at the same time, they're numbered top to bottom.

The planning chart, or program, shows at a glance the inter-relationships and sequence of all the major steps, along with their individual lead times. Selecting which steps and how many to monitor takes a good understanding of the manufacturing processes involved, as well as sound judgment. (For one helpful technique, see "Critical Path Scheduling," FACTORY, July 1960.)

The third phase of the study is to plot the progress or status of things as of the date of the study. The number of parts or subassemblies at each monitored point is counted in terms of end-product units. These quantities are shown with bar graphs (Fig. 3), keyed by number to the check-points on the program chart. To keep people from getting hysterical about temporary shortages or fall-downs, it might be a good idea to use an outline bar to show the number of parts virtually complete, and a solid bar to show the ones actually finished.

The fourth phase is to "strike the line of balance" (or, if you're an engineer, to correlate progress with objectives). The line of balance indicates at what level each bar on the status chart should be if the job is to stay on schedule. Normally, the line steps downward to the right. If the line just hits the top of each of the bars, you're perfect—exactly on schedule. Of course, nobody gets such idyllic results even once, let alone throughout the manufacturing cycle. But the line shows at once just where you're off and where you're likely to be off in the future. Bars that don't reach the line of balance represent shortages; those that pass through it show excesses (probably caused by over-production or over-zealous purchasing).

To strike the line of balance, you plot how many units you should have at each check-point as of the date of the study. First, from the program chart (Fig. 2), pick off the lead time for the first check-point. In the example shown, this is 24 working days (number 1—a purchased part). This lead time is plotted on the objective chart (Fig. 1) to the right of the study date. In this case, the study date is May 1, so the lead-time date for check-point 1 falls early in June, 24 working days later. Next, you extend this point vertically until it hits the schedule (objective) line. Here, the contact point falls at about 54 units. From the contact point, you move horizontally across to the progress chart (Fig. 3). Draw a line where the status bar of check-point 1 is cut. This is the balance line for that check-point.

The same thing is done with each of the other check-points. Points 2 and 3, for instance, have lead times of 22 days, point 5 has 16 days, etc. When all the points have been extended from the objective chart to the progress chart, and the horizontal balance lines have been connected, you'll have a set of steps, sloping down to the right. This is your line of balance as of the study date.

PUTTING LINE OF BALANCE TO WORK

Interpreting the Line-of-Balance charts is fairly simple. For one thing, you can now ignore the objective chart. It has served its purpose until you strike another line of balance. The progress chart tells you which bars failed to reach the Line of Balance; that is, at what check-points you have shortages. By checking back with the program chart, you can see how these problem points affect the over-all job. Normally, you start at the end of the process and work backwards toward the beginning—toward the longest-lead-time items.

In our example, the shipping point is No. 12. Its bar doesn't reach the line of balance, so you're behind schedule there. Same thing at points 11 and 10. But you're okay at point 9. Since 10 depends on 9 and 8, you know 8 is the offender. Both 8 and 7 are short, but you have plenty of the purchased items at check-point 6. What's holding up 7? You trace it back to 4, which is seriously short. This is holding up the whole parade (since 2, 3, and 5 aren't serious). You now know where to dig. There's no point in putting the heat on the other "short" operations until you solve the problem at check-point 4.

To put a program back on schedule, you can either plot a new, steeper objective curve, or break the log-jams and adjust your plan to meet the old objectives. This is a normal rescheduling problem you can attack with conventional techniques: try to overlap operations, go on overtime, farm out overloads, etc. The difference is, you know exactly where the trouble is, thanks to Line of Balance. And you know who should solve it. (If a supplier isn't delivering on schedule, for example, maybe you should help him pinpoint *his* problems with a Line-of-Balance study). Later on, striking a new line of balance will help you evaluate how effective your corrective action has been.

Even in a fairly small operation, where plant-level managers know what and where their troubles are without Line of Balance, the charts can be a terrific time-saver. They show project status at a glance, and are excellent tools for coordinating subcontractors and reporting to customers on future deviations from schedules. They also give you precision inventory control over critical or particularly costly materials.

Then, too, you just *might* find that your bottlenecks aren't really where you think they are. Maybe you're trying to cure the symptom instead of the disease. With Line of Balance, you can zero in quickly and concentrate your efforts, probably in plenty of time to head off approaching grief.

The small jobs can add up to

BIG SAVINGS

Plant management men at Lear, Inc., Grand Rapids, Mich., have parlayed their attention to detail into annual savings approaching $100,000.

"Methods improvement is a case of blood, sweat, and toil," one Lear manager says.

This kind of thinking usually results not in dramatic economies of the six-digit variety, but in savings of $100 here and $1000 there. It's the aggregate of all these little things that can really give big savings.

More important perhaps than amount is that the Lear system enables managers to cut costs in a number of key plant operations. In contrast, a lot of effort toward the big hit usually confines the saving to one department.

A noted manufacturer of aerospace and electronic systems, Lear maintains plants in Los Angeles, Grand Rapids, and Elyria (Ohio).

Here, keyed by function, are the savings Lear plant men will realize this year.

STORES

At the company's Electro-Mechanical Division, clear plastic boxes have been substituted for the cardboard cartons that were formerly used for storing hardware. Whereas the cardboard cartons became unsightly and lost rigidity after some usage, the plastic boxes can be used indefinitely. Estimated yearly savings: $7465.

METAL FINISHING

A Selectro Vibro-finisher that replaces hand burring has already saved the Lear-Romec Division $4670 in direct labor charges during its first five months of operation. Total direct labor savings this year should be over $10,000 on a capital investment of $6450.

The machine-controlled operation gives much greater uniformity in radii, corner breaks, and size control. Lot sizes run through by the machine are larger, thus reducing the number of inspection samples needed for Lear's quality control plan. Besides these measurable savings, there are two unmeasurable bonus payoffs: a higher-quality finish and a smoother flow of material.

PACKAGING

A less expensive way to package and ship fragile laminations used in its motors and stators has been found by the Electro-Mechanical Division's Engineering Department. These units must be air-expressed from Grand Rapids to a Los Angeles vendor for application of adhesives, and then shipped back to Grand Rapids for further assembly. The company has been using wooden boxes with sheet metal liners to hold the delicate units. Although re-usable and generally satisfactory, the heavy boxes cost $12.85 each and, because of their weight, were expensive to air express. Now, with slight modification but no retooling, Lear uses a tote box previously used only for internal handling. This box holds the same number of laminations, cost only $3, is re-usable, and costs much less to ship. Made from high-impact plastic, it's 6¾ pounds lighter than the wooden version.

REPRODUCTION METHODS

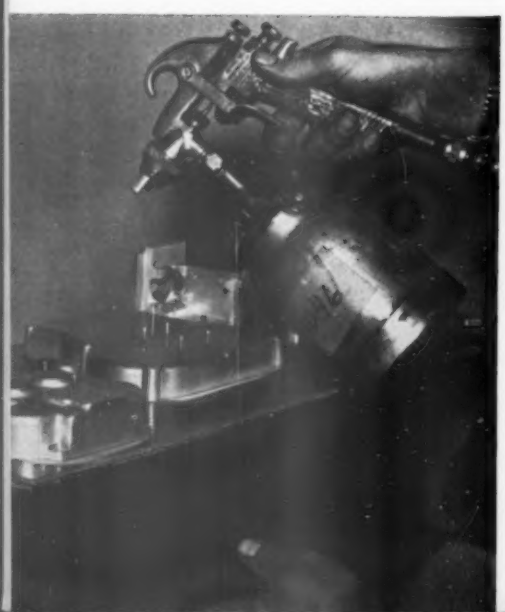
Offset printing of product photos has achieved a big cost reduction at the Lear-Romec Division. In a 10-week period, as many as 1780 prints of 40 different photographs are used in contract-engineering for illustrating various proposed operations and products. Under the old system of furnishing glossy or mat photos for these illustrations, the cost was approximately $1780. Under the new offset system, the total cost for the same prints has dropped to less than $145.

THESE SMALL CHANGES SAVE OVER $12,000

TINY AUTOMATIC SCREWDRIVER (left) is saving Lear's Western Service Facility over 30 man-hours a month—for an investment of just $15. The old heavy-duty-type automatics were found to be too cumbersome and expensive for work on small electronic controls.

A specific need to speed up overhaul of vertical gyros led to this invention. Powered by a surplus motor, the tiny tool is less than 6 inches long. It completely eliminates the need to hand-turn the 32 screws on each gyro cover.

Here's how it's made: A 3x5-in. piece of 0.032-gauge aluminum sheet is mounted on a 28-volt d-c geared motor. This makes a push contact switch and a double-pole, double-throw switch for reversing drive. A common screwdriver bit is brazed to one end of a 5/16-in. steel tube of 0.049 wall thickness. This piece is then force-fitted to the drive shaft of the motor. A light metal switchgear casing completes the unit.



SIMPLE SPRAY GUN, loaded with silicone varnish, has saved some $12,000 on orders for high reflection servo housings. By spraying a finish on the already brightly polished aluminum housing, expensive chrome plating is completely eliminated. Savings amount to $40 per housing. Lear's Electro-Mechanical Division uses Ajax V61-V-C51 varnish to do the job. The high-gloss finish is required to reflect heat away from the servo, which must operate at extremely high temperatures.

Turn the page

. . . SMALL JOBS MEAN BIG SAVINGS

PRESSURE-SENSITIVE TAPE is printed with the right diagram for the inside cover of every Lear control box. These diagrams used to be photographed, printed, manually trimmed, glued, and painted with a fungus-resistant varnish. Now an operator just tears the chart away from its backing and applies. The tape is already fungus-treated. Annual savings: $3000.

TOUGH CORRUGATED BOX replaces old wooden "treasure chest" used for shipping screw jacks. Where once a Lear customer (Republic Aviation Corporation) received jacks in the old black treasure chest (cost: $4.75), it now gets them in a corrugated cardboard carton costing just 31 cents. New carton saves $1331 on every shipment, simplifies handling and packing.

ELECTROLYTIC ETCHING process, similar to that used for making printed circuits, allows faster, cheaper fabrication of motor and synchro laminations—without dies. Motor pattern is fashioned directly from design master. Lear reports flat patterns of any size and shape to 0.03125 inch thick can be handled this way. Savings in instrument department: $15,000 a year.

AN ALLOCATION SYSTEM of stock control, replacing the old pull system of stock reservations, is saving $25,000 a year in inventory paperwork. Key is battery of Lazy Susan files. All entries, withdrawals, reservations are kept on file in the stock room. They provide perpetual inventory, eliminate need for yearly nose count; also permit running stock-need planning.

A

FACTORY

ENGINEERING AND TECHNOLOGY REPORT

LUBRICATION

NO. 12

A program for plant LUBRICATION

To organize or not to organize? Whether your plant is large or small, here's a report that will convince you that an efficient plant lubrication program is one you can't afford not to have.

Why—what's to be gained? That's the first question a plant manager usually fires at you when you propose an organized lubrication program. He argues: "We've got a good full-time oiler right now." Here are five good reasons—any one or any combination of these can justify the added cost of a sound lube program—as it did for us at Kodak Park:

1. Lower maintenance costs
2. Increased equipment life
3. Less machine downtime
4. Fewer product rejects
5. Better operating safety

Kodak Park's own plant lubrication program has an engineering budget that exceeds the total yearly cost of lubricants. It justifies itself by the help it gives to its operating personnel, engineering department, and maintenance groups. Actually, demands for such services are so heavy the lubrication section of six men can barely keep up with them and still have sufficient time to think about new projects. Typical of the savings such services have achieved is the reduction of maintenance cost per year from 25% to 1½% of capital investment on standard fans running 24 hours a day. Pump maintenance has been cut from 50% to 15%. Only an organized program has made savings like these possible.

Why you need to assign responsibility

Before embarking on a lube program, it's essential to assign responsibility for the function. This should be given to one man—preferably full-time.

How big must a plant be to justify a full-time staff engineer? If a plant has no program, it can figure that from 10% to 20% of its annual maintenance bill is connected with lubrication. One company survey indicated that any plant of over 400 shop employees can afford a full-time man. Obviously, this does not apply to light manufacturing operations such as electronic assembly work or needle trades. Other surveys have set the line at plants with a maintenance expenditure of $100,000 a year.

Here are some of the things a full-time engineer can do for your plant:

- Cut at least 10% off the maintenance budget involving machinery and moving equipment.
- Develop standard practices in the purchase and selection of lubricants, by centralizing the activity and eliminating unqualified influences and duplication of effort.
- Diagnose the origin of a problem as lubrication, operational, or design—you can't expect an operating person to be expert in all these phases of diagnosis.

Depending on plant size, a staff engineer should report to the plant manager, chief or

By **CHARLES L. POPE**, in charge of Lubrication Engineering Section
Kodak Park Engineering Division, Eastman Kodak Company, Rochester, N.Y.

plant engineer, or master mechanic or maintenance superintendent. The important thing is for him to report high enough to enable him to get things done.

Qualifications. A staff lubrication engineer should be a good mechanical engineer. He must be inquisitive and more or less of a self-starter, since lubrication is a relatively new branch of engineering that has not yet settled down to the pattern found in other branches. He must be able to get along with people and win cooperation. He will probably have to tell some people they have been doing things wrong, and that the company is going to change certain practices. This is not easy. He may find his training in many areas far inferior to that of the people he is dealing with. He must have enough faith in the program and its approaches to be willing to tolerate some current ideas and practices. Above all, he must have the patience not to try too much too soon—just to gain a little ground each day.

Selection of shop lube men is also important. Minimum requirements are: (1) a Class B mechanic; (2) two to four years' maintenance work. They should take pride in their work, be responsible, do what needs doing without being told. But this is no job for greybeards.

Providing the right kind of training program will pay off with a qualified shop lube man. It's essential for him to receive a basic knowledge of all lubricants in the plant, and why they are used. You should also give him a reasonable estimate of the money spent on investment and maintenance of equipment that he can influence.

How to set up a lube program

The easiest and least expensive way to start is with a survey of (1) number of lubricants being purchased, (2) volumes of lubricants used, and (3) number of plant people influencing the purchases. Such a survey will probably reveal that many duplicating or overlapping lubricants are being purchased and handled in inventory.

Next step, if feasible, is to check with the purchasing department as to the handling of lubrication salesmen. The department can arrange for interviews with the lube engineer to evaluate claims and match them to plant needs. The engineer can then work out a system of lubricant specifications that will enable the purchasing department to fulfill its own job of procurement most effectively.

Three major headaches are likely to plague every new program:

1. Natural prejudice against change. Some plant people will wonder why you want to change from a type of lubrication they believe in and which hasn't caused them a bit of trouble. You can solve this by pointing to successful change-overs in other departments.

2. Fault-finding. This will always pop up with a change from status quo. Everybody will be looking for something to happen. So when the first lube failure occurs, the engineer will be told, "This is the first time . . ." You've got to roll with the punches.

3. Cut-off in business for old-time suppliers. This is the most serious problem. The standardization of lubricants may affect suppliers who have dealt with the company for years. Some plants feel they will get better service by buying from only one supplier. Kodak prefers to deal with at least two or three—no one has all the answers. You've got to decide which arrangement is best for you—and fair to the supplier. If a supplier has taken the trouble to survey your plant and engineer a lube program, it is wise to stay with him for a reasonable time—unless the lubricants don't work as they should.

How to purchase and store lubricants

Primary job of the lube engineer is to specify the correct lubricants and see they are properly stored until usage. He determines specifications by a detailed inspection of the machinery and its environment (subject to water, chemicals, and dirt), and by a study of production demands and product. One example of the influence of production demands is the punch press operation, which is followed by a cleaning operation. There's no need here to prevent the lubricant spattering onto the work. Yet closely controlled lubricant application and improved housekeeping might eliminate the cleaning operation.

The exploratory survey usually produces a long and confusing list of lubricants. The engi-

LUBRI-CATION

neer must carefully analyze service conditions to find what lubricants are actually needed. For example, consider a power department requiring a 150 SSU oil at 100 F. for direct-connected turbines, a 300 SSU for geared units, and a 500 SSU for crankcases. The 500 SSU oil can be used in the geared turbines simply by raising the oil temperature 20 degrees to give it the same operating viscosity as the 300 SSU oil. Seldom does a single production area need more than two or three oils and one or two greases.

Specifications. The main purpose of lubricant specs is to insure a meeting of minds between supplier and consumer. They also tend to insure fair competition on the basis of comparable quality. Many people mistakenly think their primary aim is to secure a reduced price. Hence suppliers fear, and rightly, that users of specs will take the lowest-priced item regardless of its reputation. This encourages them to submit products that just get under the wire or are expected to perform reasonably well. Moral: Don't buy on price and minimum specs alone—see where the product stands in the specification line-up.

Complex specifications are seldom warranted—the supplier's integrity usually suffices. In fact, specs can often be quite simple, yet adequate. Example, turbine grade oil, 288-300 SSU at 100 F.; hydraulic oil, 480-550 SSU; or squirt-can oil, 300 SSU.

The lube engineer should control the choice of all lubricants through an approved list. Prices or sources are purchasing functions. If purchasing receives a requisition for an unlisted lubricant, it should seek the engineer's approval. Usually, the engineer finds that a listed item should be used. But if a new type of lubricant is required, the engineer should be responsible for its selection and for evaluating the results.

Storage. Good practices and good housekeeping are important to prevent lubricant contamination. Always store drums under cover or on their sides. Rain and snow will cover the bungs if drums are up-ended. Breathing of drums due to temperature changes will draw water through the seals, contaminating the contents. Keep transformer switch oil under special control to insure a dry oil. Dirt that gets into oil is usually not serious as it tends to settle out. But dirt in grease is bad because grease has no way of releasing it.

Any plant using 100 pounds or more of grease per month should have a pump that can be mounted right on the container. Grease is pumped directly into the gun—empty guns can be exchanged in the storeroom for full ones. Much can be said in favor of mechanized storage equipment and mobile facilities now on the market for dispensing lubricants. Advantages: contamination prevention and reduced labor costs. Only a study of the individual problem will disclose how much of such equipment is needed and how well it will pay off.

Test facilities. The extent of test equipment for lubricant quality control and research will depend on the size and scope of the activity. Many large companies have metallurgists, specialized laboratories, and other helpful facilities. Smaller plants cannot afford them, and must take advantage of the facilities of their oil and materials suppliers. Smaller plants can also study technical literature and attend technical meetings where they can discuss problems with those in a more fortunate materials-testing position.

Testing can be limited to observing whether the lubricant appears to be the same as the last batch (by someone who knows what's he's looking for), a simple viscosimeter test (for oils), a penetrometer test (for grease), or a corrosion test (for rusting). An accurate viscosimeter costs only a few hundred dollars, a penetrometer about $200. A portable viscosimeter—accurate to within 5%—costs even less, and is close enough for most work.

The corrosion test (for gauging the effect of the lubricant on materials of construction) requires only a bit of polished steel and a beaker of oil, plus a hot water bath to heat them. For this and other tests, standard apparatus is available.

How to lubricate machines properly

Another major responsibility of the lubrication engineer is to standardize procedures for lubricating the plant. This, in a nutshell, is the job of getting the right lubricant to the right place at the right time in the right quantity at the lowest cost.

There are almost as many ways of doing this as there are manufacturing plants. Should lube men have to sign (as with date or punch mark) to show the work has been done? No, if they are on regular routes. Yes, if the period between servicing is more than 4-5 weeks. Yes, also, if there is a turnover in the men doing the route at different times.

A lube man should be allowed time for modest machine cleaning during lubrication. But major cleaning and painting is usually best done by others as required. A favorite question: Who should lubricate motors? Answer: The electric shop personnel, if they are inspecting them. But the lube man is capable of this if he's making the routine inspection.

A plant lubrication manual can be very useful in training and upgrading lube men. Its contents can range from an elementary course in lubrication to specific company lubrication policies, practices, and lube specifications.

Why you need good records

The first year of a program usually shows up the need for better records. At the start the only record you may be able to get is "Oh, we don't use much oil" or "I put it in maybe once a week." Here are the basic records needed, and the purpose they serve:

- **Total gallons of oil and pounds of grease used per year (each type).** Indicates waste; determines cost of application, wiping up, and disposal. This is a minimum requirement.
- **Amount of lubricant used by each department.** Discloses where you should spend your time to reduce costs, and whether wasteful practices are creeping in.
- **Oil used by each air compressor or steam engine.** A difference in feed rate of a few drops per minute can mount up to a sizable volume. Extra amounts in steam engines lead to extra load on boiler feed-water treatment. Extra amounts on air cylinders lead to greater explosion hazard, more cylinder deposits, and higher maintenance to obtain oil-free air.
- **Amount of oil used on each hydraulic system.** Tips you off on which are leakers, causing waste and higher housekeeping costs if not properly maintained.
- **Condition of oil and history of oil changes in all important circulating oil systems.** Will show deterioration of oil in service and guide you in scheduling oil changes.
- **Stock withdrawals.** Determines quantity to be ordered, frequency of ordering, and reorder point. Useful in preparing maintenance budget for each operating department for repairs to equipment affected by lubrication. Thus, it shows where to concentrate on cost reduction by studying reasons for failure. In one case, modification of an EK dragline conveyor cut the cost of moving a product from 19 to 6 cents a ton.

Here are optional records that may prove profitable:

- Analysis of all lubricants offered for purchase, with initial test results.
- Performance records of lubricants under controlled conditions.
- Research and development records on new lubricants and materials.
- Examples of all lube failures—to demonstrate remedies and educate operating people.

How to solve lube problems

The person running a lubrication program will often be confronted with cases of "Will it work or won't it?" This happens because, as fast as one learns, technological progress goes just one more step beyond immediate knowledge. Such problems can usually be resolved into a single critical question for the lube engineer: Does the problem concern load, speed, contamination, or some other factor beyond his immediate knowledge?

Analysis of known and anticipated answers will generally show the right track to follow—along new developments in lubricants or materials, or even in a complete redesign of equipment. After such an analysis, the engineer will have to take advantage of past experience and advance reading on the subject in technical journals. Occasionally, he will be lucky enough to find someone who has been working in the area beyond his own knowledge. But he learns most from the actual equipment in service.

To solve his tough problems, the lube engineer must keep abreast of significant developments. These occur in two areas: lubricants and materials. They can't be divorced since the lubricant must function with a variety of materials. Similarly, selection of materials is important since some lend themselves to lubrication, and others, such as stainless steel, are difficult to lubricate. If he is to keep updated, the lube engineer should join the American Society of Lubrication Engineers. Through the American Society of Mechanical

Engineers he can keep in touch with trends in machine design. And if a testing lab is to be set up, he should take part in the American Society for Testing Materials. Attendance at pertinent technical seminars is also important.

Choosing the right lubricant. With the higher temperatures that result from higher speeds, speeding up of processes, and drying operations, many conventional materials become unstable. For such applications there are available new metals and plastics, new construction materials, and new dry organic and inorganic lubricants. Many of these have not yet developed to a point where industry can put them to good use, or can apply them without a great deal of caution. It is amazing to find the discrepancies between the way some actually perform and the way they are described in the available literature. This is no criticism of the technicians that run limited tests. But it shows that such data cannot be safely assumed to fit a particular job.

Many operating problems can be solved through use of the right lubricant, or by taking advantage of improvements in lubricants. For example, in the paper mill at Kodak Park, water-repellent lubricants and regular service are a must, because water is bound to find its way into bearing surfaces. These lubricants must also give maximum protection against rusting. It was not until the improved lithium soap greases became available that EK stopped losing 40% to 50% of bearings yearly on the wet end of the machine.

In the high-temperature operations of the glass industry and others, there are only a few choices of lubricant. Some of the newer synthetic products will work at temperatures from 75 to 100 F. higher than petroleum products, but they are quite expensive. There are aids, such as the preparation of metal surfaces by phosphating. Or the use of dry lubricants like molybdenum disulfide, which is applied to the metal in a solvent moisture that evaporates, leaving a dry lubricant layer.

In many chemical applications, inertness may be even more important than a material's lubricating qualities. There are many cases in which chemicals are used as lubricants. Among these are the silicones, tricrysl phosphates, polyglycols, glycerins, diesters, fluorocarbons, silicates, and chlorinated hydrocarbons.

Fire resistance is another important property of a lubricant in the face of higher operating temperatures. In many cases the so-called non-flammable lubricants should be used.

Checking the material. Often a different lubricant is not the best answer to a problem. The trouble may be with the materials of construction. But even here what works well in one place may not work in another because of oversight of some critical factor.

Choice of bearing materials often becomes a problem. For example, aluminum bronze bearings for wrist-pin bushings may multiply service life as much as 30 times. But against this must be weighed the expense of surface finishing to 4 or 5 microinches and the difficulty of attaining accurate alignment. Also, damage may be extensive if the bearing fails. It's a matter of balancing all the cost factors involved.

Corrosion may call for stainless-steel ball bearings, which are notoriously poor, expensive, and hard to obtain. "Duliting" them with a non-galling iron manganese phosphate coating may be a satisfactory answer.

Oil-impregnated bushings have limited life, especially at high temperatures, either induced or because of load and speed. The lubricant oxidizes in the metal pores, preventing capillary flow of oil, and the bushing wears out. Its life can be greatly extended under good conditions by cutting an annular groove in the housing, pushing the bushing in, and filling the groove with oil. This provides an oil reservoir that can percolate through the bushing to provide make-up oil as the supply at the bearing surfaces is depleted.

Exploring other methods. The average lubrication program puts too much emphasis on lubricants. When facing a situation beyond the capabilities of present-day lubricants, you should explore design factors, materials of construction, and operating environment. Don't waste time vainly looking around for some mysterious lubricant to solve the problem.

Consider the problem of lubrication of chains, cams, gears, and ways, where objections to oil leakage prohibit using adequate amounts of oil. Here an iron manganese phosphate coating will provide a surface conducive to boundary lubrication (where an intermittent or thin oil film suffices). Punch press gibs at 60 rpm. will run 40 hours on two drops of oil. Most cams with a small felt pad touching the cam path will run on a few drops a week.

Automatic lubrication systems should always be considered where hazards exist, where lubricant contamination is involved, where measured amounts are needed at short intervals, or where downtime for lubrication is ruled out. But they are not a cure-all. Sometimes there's no room for them; or the piping, swivel joints, hoses, and so on, get in the way of effective operation or maintenance. Then we must look to simpler devices or methods, or the use of the so-called "lubricated-for-life" bearings. It may be cheaper to install bearings that will last 5 years without attention (if easily replaceable) than to design, install, and maintain a system that will give 15 years of operation. There are many reliable systems that supply the lubricant, but none disposes of the used lubricant. Where a man has to clean up a machine continually he often might just as well lubricate. Kodak has designed machines with automatic systems that take care of used lubricants so they only have to be cleaned once a year.

Where the profits lie

The cost of lubricants, their application, and wiping up is normally a modest cost item. The real savings begin when you learn what your lubricants can or can't do in application. They really flow with better operating procedures and lower-cost maintenance. For example:

• A vacuum fan was operating at an unstable range, pounding the bearings out every 5 weeks. Dropping the vacuum by an inch of water gave steady operation and no failures.

• Fire doors, operated frequently, had wheels mounted on bushings. They wore out in a week. The maker substituted balls in an unground race, got 8 months' wear. Kodak bored the wheels, pressed in good sealed bearings. Estimated life is now 15 years.

By the same token, the lube engineer can assist in justifying the extra capital investment in equipment for big payoffs. For example:

• Open gears and chains are expensive to lubricate, clean, and guard. Often a fully enclosed gear case pays for itself in one or two years.

• Open mechanisms last longer if not lubricated in installations like dragline conveyors below the floor. A lubricant will hold floor dirt, forming a severe lapping compound. In a dry conveyor most of the dirt falls out with a minimum of damage.

The lube engineer can also be helpful in evaluating machine maintenance and performance prior to its purchase. As a result, he can justify cost-saving changes in specifications. In view of the increasing bite of maintenance into the operating dollar, and the rising cost of repairs, surveillance of machine purchase specs by the lube engineer can cut off wasted investment, operating, and repair dollars. For example:

• A 125-hp. motor and pump were purchased with ball bearings. The maker was disturbed when he got a second order specifying ring-oiled sleeve bearings. There was a good reason. The first pump was to run intermittently about 10 minutes each hour—ideal for ball bearings. The second pump was to run continuously—ideal for sleeve bearings.

• A fan was to be purchased in which it was seen the listed bearings, at $5.75 each, would run with excessive wear, leakage, and maintenance. Instead, a $27 bearing was specified in which these characteristics promised to be negligible.

There's no telling where a good lube program will end. At EK the lubrication group is consulted on bearings, bearing materials, packings, and seals, V-belt and flat-belt drives (because belt tensions affect bearing performance), mechanical and variable-speed drives, and so on. Lubrication effectiveness is an important factor in many a seemingly unrelated capital investment, such as choosing between a variable electric or a hydraulic drive.

The lesson for a lube engineer from all this is: The field of lubrication engineering is broad, and limited largely by your own imagination. There are opportunities for improvement in almost every plant. Don't overlook them because a plant is small, or because it seems that not much can be done. And don't resist changes when they're needed.

REPRINTS AVAILABLE ... of this FACTORY exclusive report
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These people are asking . . .

What's new in material handling?

Some say: "Enough to make it worth my time."

Others say: "Nothing; I've seen it before."

Which answer is an accurate appraisal?

If you say both are correct, you are right. The difference is in the manner in which visitors approached the Eastern States Material Handling Show, Philadelphia, sponsored by The Material Handling Institute, Inc.

Manufacturers exhibited and demonstrated a great variety of familiar handling equipment—industrial trucks, cranes, conveyors, storage racks, containers, packaging equipment, and other types. There was no strzl there. If you, too, are waiting for that as-yet unconceived invention to make obsolete all present handling devices, you would have been disappointed. Many said they were. But after all, it's unreasonable to expect a strzl or a grtnk (it will obsolete the strzl) every year. Unfortunately, many of those who said the show offered nothing new are supposed to be sophisticated experts in material handling. Maybe they're too sophisticated.

But if no strzl, what was new? What did the happy visitors find that the others didn't? Primarily, they discovered new ideas because they went to the show with receptive, hopeful minds. And for those genuinely interested in better equipment there were new variations to improve speed, maintenance, life, and other characteristics of equipment. Also, there were some completely new types of handling equipment—although these are less than global in application potential.

Here is a small sampling of new ideas carried home from the show: One man saw in a vacuum lifting device the means of handling steel sheets singly with less labor than his present method requires. Another jelled his thoughts to a conclusion on a space-saving idea after examining various "narrow-aisle" trucks. A third saw in a storage-rack component a small roller conveyor for light assembly aid. We could go on and on. This particular show included a unique exhibit, called "idea center." It consisted of photos and explanations of handling improvements in plants, classified and separated by industry type.

Many acquired a storehouse of information about the latest features and specifications of handling equipment. They're ready to examine their handling problems in the light of what is available in equipment. Also, they're prepared to buy new equipment intelligently. They had the privilege of examining such developments as Nutting Truck and Caster Company's (Faribault, Minn.) new combination pallet, order-picking, and drag-line truck; Towmotor Corporation's (Cleveland) new fork-lift truck that turns its forks 90 degrees right or left to stack loads; Union Steel Products Company's (Albion, Mich.) new junior-size wire-mesh stacking container—to name just a few.

So what was new in this show? Plenty, we say, for those who went to get ideas that would more than pay the expense—in the same way readers of FACTORY profit when they read for money-saving ideas.

FACTORY

The unemployment problem

What should be done about it?

Unemployment in America persists at just under 7% of the work force. We feel this figure is disturbingly high and that the time has come to do something about it. We must support the position that our society is not perfect until every man who is willing and able to work can find a job. We believe that free enterprise—freedom for an individual to seek work where and when he chooses, freedom for men to risk their capital for the chance of profit—will provide, in the long run, more jobs than any amount of government intervention.

We believe that this economic freedom is best regulated by self-control—on the part of individuals, labor unions, and business. In times of critical unemployment, this self-control means self-sacrifice—in terms of job choice, bargaining demands, and profit taking. We believe, however, that a system of tax incentives should—and can—be developed to encourage the kind of self-regulation that is best for our economy and best for both business and job growth. These incentives should reward companies for job stabilization, employment growth, productive capital expenditures, and more realistic prices.

We believe that criteria can be set up to maintain employment ratios that are critical to our economic growth and national morale. In the absence of effective self-regulation, we urge management, labor, and consumer to give whole-hearted support to policies of the federal government aimed at developing jobs through stimulation of private enterprise rather than through public works projects.

We believe that the only way to more jobs is through higher productivity. We believe that our national growth has been impeded by uneconomic wages and inflated prices. We believe that America is at one of its most critical social and economic crossroads. In one direction it can accept the prospect of continual inflation and increasing bureaucratic regulation. In the other it can reaffirm its faith in the productivity principle.

We believe that the unemployment problem today can be traced directly to the fact that consumer needs for products and services have been largely satisfied at present price levels. There are still billions of dollars ready and waiting right now for goods and services to be produced at prices equitable to demand. When labor and management—and government—agree to that outlook, jobs will begin to grow again in proportion to our population.

On the following pages FACTORY *presents an analysis of the contributing causes to unemployment in manufacturing, plus a checklist of some possible solutions.*

L. R. Bittel

EDITOR-IN-CHIEF

To express your opinion on the unemployment problem, use the postage-free ballot on page 90A.

WHAT CAUSES UNEMPLOYMENT

A list of 90 factors

The causes of unemployment—and perhaps its cures—are deep in the free enterprise system. They stem from the sensitive balance between the profit incentive and the desire for personal security. They reflect the many facets of the American culture: our personal and political freedoms, our consumer habits, and our level of technological achievement. They demonstrate the growing influence of the economies outside our borders.

PROFIT-ORIENTED FACTORS . . .

. . . based upon the assumption that (1) conditions that discourage profits tend to reduce, curtail, or stifle investment—and, therefore, job growth, and (2) labor-saving action taken by business to cut operating costs has a short-term effect, at least, in reducing employment or in displacing workers.

Profit-discouraging conditions

1. Uneconomic labor costs. Generates higher prices, stimulates labor elimination or replacement.
2. Declining profits. Discourages capital investment.
3. Shortage of investment capital. Discourages modernization and expansion.
4. Cycling business climate. Disappearance of growth stimulators. Absence of investment incentives.
5. Excess plant capacity. Causes unstable employment.
6. Weak research and development programs. Fail to create new products to supplant obsolescent lines.
7. Management incompetence. Fails to preserve jobs by aggressive marketing, productivity improvement.
8. Management conservatism. Over-prudent policies cause attrition of existing jobs.
9. Administered price schedules. Tend to restrict competition, discourage potential new companies.
10. Reciprocity buying. Weakens normal marketing.

Labor-saving factors

11. Company mergers, consolidations, centralization.
12. Plant relocations. Take jobs to new locales.
13. Process improvement through mechanization. As often aimed at labor-saving as at adding capacity.
14. Methods improvement. Oriented toward labor-saving as well as quality improvement and faster deliveries.
15. Conservation of utilities and supplies. Trims internal waste, but may affect number of external jobs.
16. Cost reduction plans. Eliminates, combines jobs.
17. Long-life equipment. Reduces maintenance labor.
18. Improvements in working conditions. Air conditioning and good lighting favor higher productivity.
19. Mechanization of communications and information handling. Television, recorders, data processing eliminate human links, clerical parts of other jobs.
20. Wage incentives. Obtain more output per person.
21. Subcontracting-out work. Controls variable costs, but prevents growth in company employment roles.

JOB-SECURITY FACTORS . . .

. . . based upon the assumption that conditions developed or action taken on the part of individuals or labor unions to (1) limit labor mobility, (2) over-protect jobs, or (3) increase labor costs without concurrent increases in productivity, tend to reduce employment levels, especially over the long haul.

Restricted labor mobility

22. Worker's geographic immobility. Family ties and such that hold a person in a static labor market.
23. Worker's occupational immobility. Job or industry ties and "status quo" inertia that prevent a worker from actively seeking employment in new kinds of work.
24. Employee pensions. Emphasize job security and immobility rather than development of skill security.
25. Welfare programs. Discourage worker mobility.

Protective behavior

26. Voluntary output curtailment. Attempts to protect or prolong jobs by arbitrarily limiting output.
27. Seniority clauses. Discourage dynamic job-seeking.
28. Job assignment restrictions. Raise labor costs.
29. Apprenticeship restrictions. Inflexible programs limit occupational growth, lengthen training period unnecessarily, and fail to train for future skills.
30. Acceptance by worker of unreasonable workloads. Done to protect jobs. Also reflects inadequate supporting services or obsolete buildings and equipment.

Uneconomic labor costs

31. High wage demands. Wish for certain, short-term gains as compared with risk of future compensation.
32. Fringe benefit costs. Management hesitates before taking on permanent employees.
33. Featherbedding. Causes uneconomic labor costs.
34. Non-representative union structures. Encourage self-protective practices leading to high labor costs.
35. Union work rules. Set up barriers to change, and to management that takes on new ventures.
36. Curtailment of management rights. Aimed at maintenance of status quo rather than justifiable progress.
37. Jurisdictional disputes between unions. Discourage enterprise, cause strikes and waiting time.
38. Strikes. Cause avoidable unemployment, discourage risk capital, motivate plant relocations.

IN MANUFACTURING PLANTS?

They include "acts of God," and they bear strong relationships to federal policies and legislation.

Causes of unemployment vary in intensity and immediacy. Often they are hopelessly interwoven. Some are double-edged: they may cause or relieve unemployment, push employment spirals upward or downward. To help you comprehend their impact, the editors of FACTORY *offer this arbitrarily classified list of 90 factors.*

AMERICAN POLITICAL, ECONOMIC, AND CULTURAL INFLUENCES . . .

. . . established by (1) the American political system, (2) behavior of its work force, (3) general buying habits of its citizens, and (4) state of technological proficiency, which make possible accelerated labor savings.

American "way of life"

39. Freedom to choose where to work, when, and how long. To quit or "retire" from the work force at will.
40. Freedom to choose an occupation. Or to change it.
41. Freedom to compete. To enter any field of work.
42. Freedom to invest. Or to spend, save, or risk.
43. Growing appetite for "free" government services.

Behavior of the work force

44. Rapid growth of work force. Uncontrollable, influenced by general economic conditions, war, peace.
45. Imbalance of the work force. With increasing proportion of workers under 25 and over 50.
46. Shift from farm to non-farm work. Crowding into urban areas, centralizing labor supply.
47. Shift from blue-shirt to white-collar occupations. Growing difficulty in justifying "indirect" labor.
48. Styles of job status. General unpopularity of blue-shirt and non-manufacturing service occupations.
49. Working women and wives. Adding to total work force. Irregularity of their presence in work force.
50. Multi-income families. Making part-time or temporary work attractive, full-time work less desirable.
51. Moonlighting. One worker holding down two jobs.
52. Skill obsolescence. Such as in carpentry, visual gauging of heat treating and ceramic firing.
53. Lag in acquiring new skills. Such as instrument repair, electronic analysis, computer programing.
54. Racial and age prejudice.

Consumer buying habits

55. Post-World War II market satiation. Especially for consumer capital goods.
56. Shifts from "product" to "service" demands. Change in emphasis from products that satisfy "needs" to "convenience" products.
57. Resistance to purchase of high-cost capital goods.
58. Increasing dissatisfaction with goods.
59. Lagging GNP growth. Slump in gross national purchases of goods and services needed to stimulate productivity increases and further employment.
60. Desire for more reliable products. Greater quality sensitivity.
61. Desire for low-cost products.
62. Failure to respond to obsolescence marketing.
63. True product obsolescence. Such as railway cars for commuting, coal tar for roads, leather for upholstery, pottery, fuels, building materials.
64. Consumer advisory obsolescence. Where product is downgraded by consumer, medical, or government research; unfavorable publicity; new legal implications.
65. Unpredictability of buying habits. Sensitivity to business-cycle psychology, which sends demands and expectations up and down rapidly.
66. Cultural buying habits. For Easter, Christmas, school, vacations, and the like.
67. Seasonal buying habits. Weather-influenced buying of air conditioners, gardening equipment, boats.
68. Fad buying. And its inevitable reversals.
69. Unstable military contracts. Cancellation of project funds, especially in defense contracts.

Level of technological advance

70. Labor-saving processes. Engineering and scientific methods that decrease labor per unit of product.
71. Labor-saving materials. Which replace high labor-content materials and labor-consuming processing.
72. New labor-saving products. Machinery available for increasing productivity, decreasing labor content.
73. Processes unsuitable for human control. Continuous x-ray inspection, high energy radiation processing, high noise levels, extremes of heat or cold.
74. Processes beyond human control. Systems beyond mind's ability to integrate or make decisions rapidly.
75. Operations research techniques. Statistical analysis methods aimed at minimizing manpower.
76. Automatic data processing.

For more causes of unemployment (and some possible cures), turn the page

. . . UNEMPLOYMENT CAUSES

FOREIGN INFLUENCES...

77. Cheaper foreign products. Labor cost advantages.
78. Better foreign products. Superior design and workmanship.
79. Shrinking foreign markets. Vigorous competition from European and Eastern nations, high duties on American goods, anti-U.S. sentiments abroad, dollar shortages, European marketing combines.
80. Relocation of U.S. plants abroad. Exports American jobs.

NATURAL CAUSES...

81. Catastrophes. Fire, explosions, wind damage, floods, snow, heat, and crop failures.
82. Climatic influences. Seasonal weather changes, dry and wet regions, hot and cold zones.

GOVERNMENT INFLUENCES...

. . . based upon the assumption that taxes (regardless of how justifiable or necessary) and legislation restricting business tend to dampen the profit incentives and result in restricting long-term job growth.

83. Domestic tax structure. As it stimulates or discourages business and individual enterprise.
84. Monetary policies. Affecting interest rates, money supply and, especially, inflation.
85. Depreciation policies. Fail to recognize effect of inflation or technological obsolescence.
86. Tariff policies. Permits excessive foreign price competition.
87. Foreign aid programs. Stimulate foreign industrial growth.
88. Minimum wage law. Discourages employment of marginal producing employees.
89. Over-protection of labor organizations. Permitting minimum of regulation and culpability.
90. 40-hour week. Spreads the work but limits management flexibility in scheduling work force, causes uneconomic wages for overtime work.

WHAT CAN BE

A checklist of 73 possibl

Some are pretty familiar. Others are far out. But in total, they represent just about every proposal that's been made to date. FACTORY's editors did the sizable job of assembling these solutions. But our responsibility ends there. THESE ARE NOT OUR RECOMMENDATIONS. For a statement of FACTORY's position on the problem of unemployment, turn back to page 85.

Generally speaking, three organized bodies of influence can, and do, take action that directly affects the state of employment. They are business management

ACTION POSSIBILITIES FOR CORPORATE MANAGEMENT

in the interests of building job stability

Self-regulation and stimulation

☐ Adopt policies of employment stability and growth to parallel profit stability and growth objectives.
☐ Extend profit planning—and profit distribution—to balance low-return years against high-profit periods.
☐ Re-examine profit-sharing so as to provide fuller employment at reduced unit cost in slack periods.
☐ Review severance pay policy to ascertain its effectiveness in motivating operating management to plan for full utilization of work force.
☐ Investigate merits of vested and transferable pension rights for displaced workers.
☐ Accelerate capital investments for modernization.
☐ Accelerate new product research and development.
☐ Adopt strong marketing methods for high-labor content products, such as hand-crafted automobile interiors and custom-finished goods.

Voluntary profit curtailment

☐ Defer automation installations until periods of rising product demand or rising economy.
☐ Plow productivity gains back into lower prices.
☐ Build product inventories in periods of low demand to be paid for, in part, by more efficient warehousing.
☐ Set aside reserves for sustaining non-productive employment in periods of reduced business activity.
☐ Share costs of retraining long-service employees.
☐ Develop incentives for early retirement during periods of economic slump.

Dependent upon new legislation

☐ Consider capitalizing employee training programs instead of expensing them. Done on premise that trained employees yield long-term benefits, just like machines.
☐ Yield management prerogatives to government regulation in critical periods of general unemployment. Includes freezing prices, wages, or employment levels.

DONE ABOUT UNEMPLOYMENT?

cures for unemployment in manufacturing

(at both corporate and factory levels); international, independent, and local unions; and the government—federal, state, and community. Underlying these three groups of influence is the collective will of all the private citizens of the United States.

In the strictest sense, unemployment is the people's problem. The government expresses the people's interest or apathy. The government fulfills a dual role as arbitrator between business and union pressure groups and as administrator of the people's choice. In the final hour, the people must decide whether they wish a welfare state with strictly regulated freedom or a dynamic free-enterprise system, largely self-controlled, and with a maximum of personal freedom.

Many of the solutions below call for self-denial and self-control. Without this self-control on the part of all factions and individuals, the solutions will inevitably trend toward greater bureaucratic regulation of individual workers and of business and industry. The solutions suggested here are of necessity sketchy and do not represent comprehensive programs. Perhaps some are unworkable. They are listed without regard to long- or short-term effectiveness in the hope they'll trigger your own thinking toward better ones.

ACTION POSSIBILITIES FOR FACTORY MANAGEMENT

in the interests of building job stability

Self-regulation and stimulation

☐ Coordinate methods improvements with natural attrition of the labor force.

☐ Put cost-cutting emphasis on materials, not labor.

☐ Set objective of leveled production, using advanced techniques for scheduling and inventory management.

☐ Develop long-range subcontracting program to match against labor fluctuations and level them out.

☐ Redesign product for ease of manufacturing into high-labor, low-material content subassemblies.

☐ Examine labor-savings proposals rigorously to ascertain their permanent contribution to lower costs.

☐ Negotiate "normal" and "make work" rates to cut cost of retaining non-productive labor in slow periods.

☐ Avoid plant relocations based upon labor rates alone. The challenge here is to modernize facilities and to make high-priced labor more productive.

☐ Extend forecast periods for labor requirements.

☐ Hire more discriminantly to obtain more flexible work force, adaptable to wide range of job demands.

☐ Integrate in-plant training programs with curriculum of local primary and secondary schools.

☐ Establish standard job classifications within the community to facilitate rehiring locally.

☐ Avoid laying off one kind of help, hiring another.

Voluntary cost increases

☐ Make short-term postponements of labor-savings installations to level out employment.

☐ Build a backlog of repair, construction, investigation projects (including training programs).

☐ Incorporate retraining or reassignment costs in figuring savings from improved methods.

☐ Set up programs to retrain displaced workers.

☐ Set up placement bureaus for laid-off employees.

☐ Reconsider approaches to guaranteeing monthly, semi-annual, or annual wages.

ACTION POSSIBILITIES FOR LABOR UNIONS

in the interests of stimulating more employment

Self-regulation and control

☐ Tap union welfare funds to help finance retraining or relocation costs.

☐ Cooperate with educational institutions, and with plants, in setting up curriculums designed to suit vocational needs of the trade and of the community.

☐ Educate membership to shift emphasis from obstruction to change to adjustment.

☐ Avoid jurisdictional disputes that delay work.

☐ Encourage membership to accept responsibility for full productivity and high-quality workmanship.

☐ Relinquish wage demands in favor of price cuts when negotiating new contracts.

Security relaxation

☐ Restrain wage increase demands that are out of line with national (not company) productivity increases.

☐ Relax seniority worship to encourage labor mobility and retraining. Also to attract capable young men into blue-shirt and other unionized operations.

☐ Open the way for negotiations for variable rates—one rate for productive, another for "made" work.

☐ Consider yielding critical flexibility to management in making job assignments within the plant.

☐ Liberalize apprenticeship rules to permit specialization according to types of equipment rather than along lines of some set tool box. Encourage acceptance of more apprentices and inter-craft transfers.

☐ Abandon adherence to work rules that support featherbedding and other wasteful practices.

Dependent upon new legislation

☐ Relinquish certain bargaining and strike privileges when unemployment is critical. For instance, when unemployment rises above a certain agreed percentage of the total work force, negotiations for general wage increases might be declared out of bounds.

ACTION POSSIBILITIES FOR FEDERAL GOVERNMENT . . .

. . . based upon assumptions that (1) faster, more meaningful collection and dissemination of employment statistics would guide all factions toward more intelligent action, (2) tax incentives appealing to profit improvement would provide the growth stimulation our economy needs, (3) certain economic burdens with social significance can best be assumed by the federal government, (4) in the event of prolonged levels of critical unemployment, legislation aimed at job creation is a necessary restriction to be placed upon individuals, labor unions, and business organizations.

Administrative improvements

☐ Refine employment-statistics collecting so figures are more representative, especially in separating permanent from temporary job seekers, and in demonstrating the number of working wives and multi-income households among job seekers.

☐ Speed collection, assimilation, and analysis of employment figures, job availability, and so on—especially at the community level.

☐ Publish a "Balance of Labor" Index directed at community level. Would include the number of workers coming into the labor force each month, number dropped, new business started, business failures, etc. This would highlight for the community any progress made toward absorbing locally the increasing labor force, which on a national basis amounts to something like 25,000 new job seekers each week.

☐ Organize community Employment Action Councils for the faster dissemination of information and to act as clearing houses so that individual plants can help one another in dealing with unemployment.

☐ Coordinate interstate employment services for speedier and more effective transfer between states of information about jobs and job seekers.

☐ Establish tighter unemployment compensation criteria, restricting benefits to seekers of permanent work, and true breadwinners.

Tax incentives

☐ Modernize depreciation laws to reflect the impact of both inflation and technology.

☐ Reduce business taxes as an incentive to further capital investment and new products development.

☐ Reduce high-bracket income taxes—the main source of investment capital.

☐ Permit income tax computations on some basis other than 12-month periods. This would enable corporations to balance out wide swings in profits—and encourage retention of work force and inventory building during recession periods.

☐ Penalize (through tighter tax laws) dual incomes for the same household, moonlighting, working wives, and similar situations.

☐ Set up a system of tax incentives that reward business organizations for money spent in (a) retraining workers, (b) sustaining employment on "make-work" jobs, (c) decreasing labor turnover, (d) inventory accumulation, (e) investments for modernization, (f) employing older workers, and (g) price cutting.

Spending programs

☐ Increase federal funds for retraining and relocating workers. Program administration would be delegated to the community level with the federal government furnishing coordination.

☐ Increase allocation of federal funds for industrial development—with emphasis on improving roads, power, and water supplies.

☐ Increase defense spending, including stepping-up draft to build armed forces to full length.

☐ Increase public works spending.

Regulatory legislation

☐ Establish critical levels of unemployment in terms of the percentage of the total work force and the duration of this unemployment level. If an unemployment emergency were declared, management and labor would submit to greater regulation—such as holding general price and wage levels. Another variation would be to establish a series of critical steps in the unemployment rate; at each step, a more rigorous legislative policy would be invoked.

☐ Restrict monopoly power of labor unions so leadership will be more responsive to the desires of individual members.

☐ Revise tariff policies to establish flexible rates that protect specific industries when employment in those industries drops below an established minimum.

☐ Reduce legal work week to a figure below 40 hours.

WHAT THE PEOPLE CAN DO

☐ Recognize that elements of the unemployment problem are the responsibility of the individual citizen and cannot be blamed exclusively on business, labor unions, or the government.

☐ Accept tax burdens aimed at stimulating business growth and at protecting jobs.

☐ Overhaul the public school system to relate curriculum more closely to vocational needs, to establish higher standards of student and teacher performance, and to consider compulsory training in service work for voluntary drop-outs.

☐ Stimulate community interests in industrial development to hold present industry and attract new ones.

☐ Adapt to the new rules of living, which have outmoded old concepts of immobility, unrealistic economic ideas, resistance to change, and the thought that "the world owes me a living."

What's your opinion on unemployment?
Mail your special ballot today.

VOTE HERE NOW

Provide President Kennedy with your much-needed views on unemployment problems at the plant level. Your ballot will be forwarded by FACTORY to the President's Advisory Committee on Labor-Management Problems.

YOU HAVE an unusual opportunity to let the President know how you feel about the effectiveness of proposals being offered to reduce unemployment. FACTORY will tabulate the opinions of its readers. Then we'll send the summarized results to Washington. Results of this survey will be published in a forthcoming issue of FACTORY.

MAIL POSTAGE-FREE BALLOT TODAY

JOB TITLE

_____

_____

NUMBER OF EMPLOYEES AT YOUR PLANT

_____

PRODUCTS MADE AT YOUR PLANT

_____

_____

What effect do you believe the following measures would have on creating more jobs in your plant?

	NONE	SOME	MUCH
1. More stress on leveling year-round production	____	____	____
2. Introduction of new products into company's line	____	____	____
3. Reduction of subcontracted-out work	____	____	____
4. Postponement of methods improvement projects	____	____	____
5. Tax incentives to reward stabilized employment	____	____	____
6. Legislation to shorten the work week	____	____	____
7. Stronger marketing effort by sales department	____	____	____
8. Government-regulated price controls	____	____	____
9. Government-regulated wage controls	____	____	____
10. Higher tariffs to protect your industry	____	____	____
11. More government spending for defense, public works	____	____	____
12. More capital spending by private industry	____	____	____

In addition, Secretary of Labor Goldberg asks:

13. If government-financed retraining of technologically displaced workers were made available, would you use it? ..... Yes___ No___

14. How many of your employees will be displaced in any way by labor-saving installations next year? None___ Less than 1%___ 1 to 5%___ More___%

90 A

CAST YOUR BALLOT

on what can be done about unemployment

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FACTORY

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90 B

PLANT EEs— WHY SO FEW?

An editorial commentary

BY GERALD C. QUINN
ELECTRICAL EDITOR, FACTORY

A graduate EE, Jerry Quinn had 18 years' diversified experience in industry before coming to FACTORY in 1957. He has always been a vigorous member of his profession, is now co-editing a new AIEE power systems handbook. Jerry is also a member of AIPE.

This month I'd like to discuss a question that has been handicapping plant operating management increasingly in recent years: How do you get and keep topnotch plant electrical engineers?

While this problem has been masked somewhat in recent months by layoffs in many industries, no one doubts that the shortage will return to its previous level with the first upturn in the industrial index. The situation has become so frustrating that some companies have quit trying, and are paying the penalty of complete dependence on contractors, consultants, or vendors for power system changes or planning. Other plant managements have had to be satisfied with EEs who don't measure up to their standards.

At the risk of over-simplification, we can rationalize three arguments why so few EEs (or men with electrical engineering competence) are in plant operating work: (1) There aren't enough engineers to go around; (2) salaries are too low; (3) engineering schools haven't taught graduates to look on such jobs as professionally desirable or challenging. There is a measure of truth in each claim:

(1) Job openings for graduating engineers of all types are more numerous than are engineers to fill them. Yet every year thousands of engineers (many of whom are EEs) go into various occupations from real-estate selling to bowling-alley management. These men obviously were not convinced of any shortage of engineers.

(2) Unquestionably, many plant engineers (including electrical) are paid salaries below a level commensurate with their value to the plant. Also, plant electrical engineering jobs haven't offered the starting salaries to new graduates that the highly publicized electronic design positions have. Yet, we wonder, how many of these young hopefuls realize that five years after graduation many of those who then chose "glamour" jobs will be working at no higher salary and with less security than experienced plant engineers.

(3) This argument, to my mind, is far more important than the other two. And it's a factor that's going to be more difficult to overcome. In most schools today, there are very few courses of direct help in plant electrical engineering. But even if these courses were more widely available, there's good reason to believe that few students would take them. Why? Because most engineering faculty members no longer believe that plant operating jobs offer opportunities for students to advance themselves professionally, better themselves financially, or broaden their engineering competence.

In support of this criticism, they point out that many former students now in plant jobs seem to be limited—or limit themselves to work in narrow fields ("I'd rather work a week on a system fault study than sit for half a day on a grievance hearing"). Except for headquarters staffs in a few far-sighted industries, plant electrical engineers participate little in professional societies. For instance, only a minority of the members on the key AIEE Industrial and Commercial Power Systems Committee are in plant operating positions. And the roster of the American Institute of Plant Engineers includes few EEs.

Plant management is failing to get and keep EEs because it doesn't encourage or allow them to broaden themselves. The schools are right in sensing this. And those companies that do show leadership aren't getting their story across to the engineering schools. Many engineering faculty members admit they are almost completely out of touch with plant electrical engineering problems today.

Management has two jobs if it is to get and keep good EEs. It must make plant engineering challenging, renumerative, professionally desirable. And it must get the story across to the schools.

WHAT TO DO ABOUT TROUBLES WITH INCENTIVES

A smooth-working incentive plan can boost production by 20 to 30%. The trick is to keep it from developing into a giveaway program. Here's how to head off such troubles.

By **JOHN R. WALLEY,**
Walley & Associates, Management Consultants,
Park Forest, Ill.

THROWING THE BABY OUT with the bath is one way to solve the problem of a dirty child, but it's obviously not the best. Not as obvious, but just as faulty, is the idea that an incentive plan should be thrown out when it develops a kink.

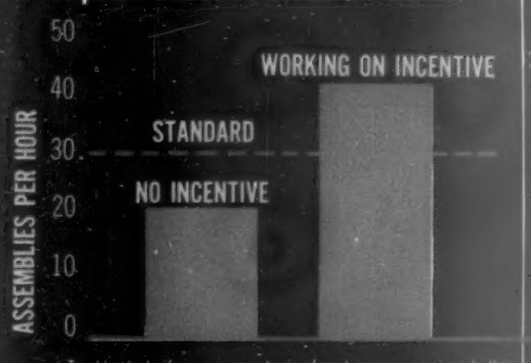
Usually, the trouble will be one of the common ones listed below. You can straighten these out or—better yet—avoid them by knowing what to look for. Recognizing the signs of trouble and taking the right action soon enough can save you headaches and money.

You're asking for trouble if you pay incentives on the basis of past average earnings rather than on established production standards. When this happens, labor costs rise and productivity usually drops to the pre-incentive low, which is often 70 to 80% of standard performance. The chart at left below shows typical results when an incentive worker is placed on a production job that hasn't been measured. During an unmeasured period of two days, the assembler turned out 20 units per hour. Then the job was time-studied, and a production standard of 28 units per hour was established. Quite promptly the assembler was able to turn out 40 assemblies per hour.

Chances are good that, if *you're* paying incentives on the basis of past average earnings, the same hidden loss is occurring. But before you can do anything about it, you must know exactly how many jobs are being paid for on this basis. You can check this in three simple steps: (1) separate hours compensated for at past average earnings from other hours; (2) calculate this percentage of the whole; (3) plot the percentage on a graph that will allow you to see changes from week to week.

If you follow this method and continue corrective

A prime cause of incentive trouble



Trouble starts if you pay on a basis of past average earnings (rather than standards). Here, a worker was turning out 20 units per hour, but after a standard of 28 units per hour was established, he easily pushed output to 40 units. Text tells how you can avoid this.

Time study men disagree on ratings

Seven time study men rated a single worker and came up with seven vastly different ratings (left). After attending 14 sessions on leveling, the raters turned in much more consistent results (right).

action—setting incentive standards for all the short-run hauls possible—you will find you can quickly reduce hidden production loss.

Supervisory incentives can be another headache. Often, when a company installs a wage incentive plan for its workers, it attempts to obtain cooperation of foremen by paying a bonus in direct relationship to incentive earnings of employees supervised.

On the face of it, this seems sound. However, in practice there's a conflict of interest. Part of a foreman's job is to think creatively, working out method improvements. But if he increases output through improved methods, the time study department must be notified. This normally results in a revision of production standards so there is no change in worker earnings. Consequently, the foreman gains nothing. On the other hand, if he doesn't report the change or, being human, forgets about it, his earnings will rise. In this case, however, standards became so loose the only remedy would seem to be to scrap the incentives.

An effective antidote to this situation is a foremen incentive plan based on the total amount saved by their combined efforts. Here's how to set it up: List all areas over which foremen exert an influence. These will include labor, raw materials, scrap loss, and the like. On this list, keep track of budget cost, actual cost (here's where the savings should come in), total savings (there may not be any), and percentage of savings. At the end of each month calculate foremen's bonus as a percentage of the total savings. Thus, if the budget allowed $58,660, but only $54,622 was spent, the total savings would be $4038 or 6.9% of the total. This means each foreman receives a bonus of 6.9% of his monthly salary.

Expect employee squabbles where there are inequities between employees performing similar work, or between those with different occupations. Such inequities give rise to numerous grievances over production standards, and employees will constantly point to another rate for comparison.

Time study men whose leveling skill is not consistent from day to day are a major cause of this. You can combat this weakness by holding performance leveling sessions for your department. The charts at left show the wide variation existing in a typical time study department. The department's seven members simultaneously rated one worker and came up with scores ranging from very low to very high. But after attending rating sessions twice a month for some months, the same men were able to rate performances within about 10% of one another. Such consistency cannot be maintained without regularly scheduled rating sessions.

Trouble finds another breeding ground if the incentive coverage is low. During day-work periods (hours when work isn't measured) employees can work at a leisurely pace. Or they can use such unmeasured hours to get materials in place, sharpen tools, and plan how to do measured work in the shortest time. Then, when incentive work rolls around, they achieve a high per cent of standard. When pay is calculated by multiplying efficiency per cent of standard by basic hourly rate for the hours worked on incentive, you pay an unwarranted cost for low percentage of coverage.

To cure this, you must measure your present coverage and then extend it as much as possible. Measurement of incentive coverage isn't difficult. For example, the management of one machine shop had the payroll department compile the information. Each man in the

Eight guidelines to trouble-free incentives

Hold payment of past average earnings to minimum.

Avoid supervisory incentive plans that pay bonuses based on employee earnings.

Hold performance rating sessions for time study men to attain equitable standard setting.

Use standard elemental data to keep percentage of incentive coverage high.

Make sure each allowance percentage included as a part of production standard is based on fact.

Instruct low producers to make sure they fully understand how incentive plan works.

Face issue of "run-away" earnings squarely.

Train foremen and stewards in time study methods so grievances can be settled on basis of facts.

time study department was provided with a copy of this analysis sheet and given the responsibility for setting up production standards for one or more of the departments listed. A competitive situation developed since none of the men wanted to have his department show the lowest per cent of coverage. As a result, incentive coverage increased to 78% of hours worked within a year.

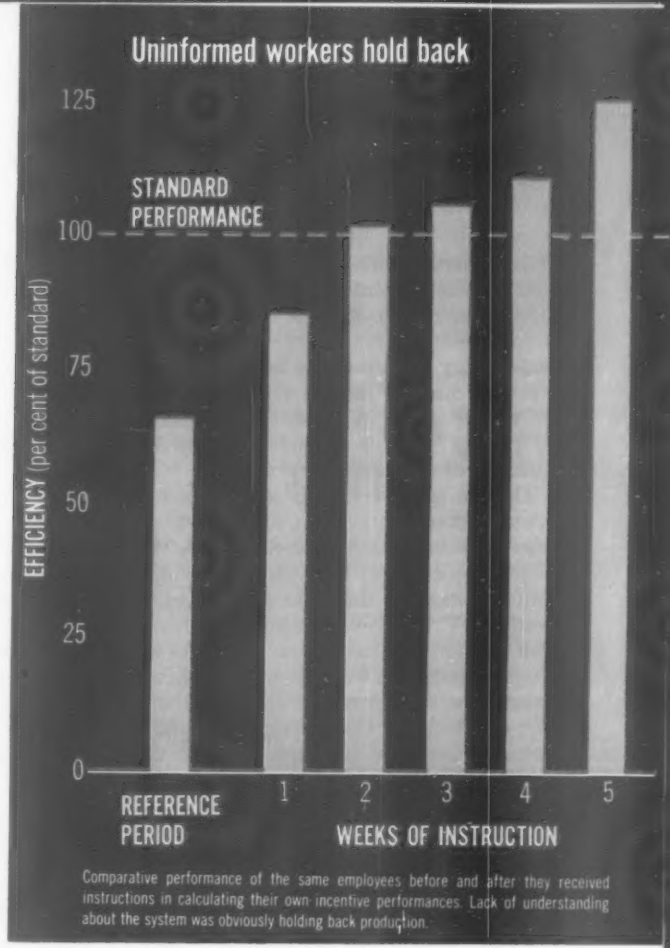
Developing standard elemental data through time study can increase your coverage in a relatively short time. Individual studies covering a line of work can be combined, and from these data, tables and charts can be established for easy, quick, equitable setting of production standards. When standard data are used, it's not unusual to find that up to 93% of direct labor hours are measured.

Compensating employees for time lost due to unavoidable delays and for personal time is an acceptable practice, but can be as potentially dangerous as the things already mentioned. Normally, an industrial engineer does this by adding a percentage to the leveled time-study time. But the danger lies in not properly measuring the circumstances before determining the percentage to be added.

To remedy this, you should measure personal and unavoidable delays through time study. Extending over the entire work day, these studies should record every minute from start to finish. They should also cover a number of representative days in order to make the sample valid. During the period studied, record all elements of delay and accompanying time lost. Then summarize and review this information with the department foreman, superintendent, and others. In this way you can determine what delays are unavoidable and come up with an accurate percentage to be added.

But remember, if allowances are made for fatigue or other intangible factors, measurement is less definite. Management frequently establishes an arbitrary allowance or negotiates such percentages. But production standards with percentages added in this manner are known to be incorrect by the amount added. And their use for scheduling, machine loading, cost estimating, or cost control is limited.

Misunderstanding over how an incentive plan works will cost you money. Take the example of a corrugated container plant whose vice president was ready to take out the wage incentive plan covering 150 workers because too few employees were earning incentive pay.



Comparative performance of the same employees before and after they received instructions in calculating their own incentive performances. Lack of understanding about the system was obviously holding back production.

He felt the cost of keeping the plan in effect was unwarranted. But investigation showed that although production standards were established fairly, the employees could not calculate—and hadn't been told—the number of production units needed to meet them.

To raise productivity, this plant put a simple plan into operation. First, an industrial engineer ran a reference check of a folder-taper operation for the previous five weeks. The results of this check—each of the girls ranged within 50 to 75% of standard—were posted in the department. Before starting each girl on a new taping job, an industrial engineer showed her how to figure the production required to meet the standard—and how to produce at 125% of standard. After the run was completed, he again showed her how to calculate her incentive performance.

Results were immediate. The first week, average performance went to 90% of standard, then climbed to 102, 110, 115, and 125% in consecutive weeks. The efficiency per cent of standard—before and after—is shown above and is typical of results obtained after careful employee instruction.

Excessive incentive earnings can be another source of trouble. The most common cause of this is a gradual loosening of production standards through unreported

changes, methods improvements, or short cuts taken by the operator. In any event, the worker is able to produce more than was originally thought possible when standards were established. Secondary causes for "runaway" incentive earnings may be initially incorrect establishment of standards, relaxation of quality, or deliberate falsifying of counts.

The correction procedure when quality has been relaxed or counts falsified is not difficult since it's simply a matter of policing. Management has the responsibility for maintaining standards in both areas.

But when faced with "runaway" earnings, management generally tends to overlook the situation until high labor costs force the company to discontinue manufacturing the product or shut down the plant. So many problems are involved, and revision of an existing incentive plan is so distasteful the job is usually put off until it can no longer be ignored.

There is no fixed solution to problems in this area since every revision of a wage incentive plan is different. However, there are certain general principles you should follow:

- Don't rush changes. An incentive revision is basically a change in thinking as to output per hour, earnings, and effort. Changes must be paced to the ability of people to accept and absorb them.
- Take a firm stand from the start, carrying the revision through to completion, or don't undertake the project at all.
- Meet the problem of past earnings squarely before starting a revision. Reach an agreement as to the amount employees will be paid if output on new production standards does not warrant same former pay.
- Use qualified outside counsel to gather facts and present recommendations that will minimize or eliminate special-interest pressures in the event of a basic disagreement.
- Describe complete proposed wage incentive plan in writing before starting actual revision. Have it made part of the union contract.
- Reach an agreement on what is normal and establish benchmarks in major departments. This way, arguments over production standards can be restricted to comparison of output on key jobs.
- Provide adequate training in work measurement and in operation of the proposed incentive plan for all persons who will be involved in the revision. Such training should be on company time.
- Avoid changing more than one major department at a time since adequate supervision and industrial engineering personnel must be available for a week after revision to answer questions, calculate earnings, and instruct workers. This first week is critical.
- Make adequate controls part of the revised incentive plan administrative procedure so trends can be observed in time to make changes for keeping the system fair to both management and the worker.

Grievances are to be expected when you use wage incentives. If production standards are accepted without complaint there's a possibility that someone is too liberal. Or worse, employees have no interest in producing what you feel is an honest day's work.

Setting up a program for company foremen and union stewards is a good way to solve the problem of grievances. Presented on company premises with actual plant equipment and local case problems to supplement classroom instruction, foremen and stewards see their responsibilities in a new light.

Subject matter in such a training program should be practical. Since the purpose of the program is to improve understanding, no attempt should be made to sell company policy. Here is a suggested list of 10 topics to be covered:

1. Introduction and history of time study.
2. How to analyze an operation for purposes of time study.
3. How to list elements on observation chart.
4. Delays: how to calculate allowances.
5. Performance rating.
6. Calculation of standard time.
7. Standard elemental data.
8. Use of standard time values for manufacturing controls.
9. Wage incentive principles.
10. How to work together to settle grievances arising over time study or wage incentives.

When the course has been completed, each participant should be able to take a time study and have a practical conception of how wage incentives operate.

Companies that use this approach report that as long as foremen and stewards have a good knowledge of how time study men set production standards and administer wage incentive plans, most employee complaints can be settled before they become grievances. The points at issue can be narrowed down, making a compromise possible. This method takes grievances out of the realm of opinion and concentrates on facts. When parties deal with facts, it's always possible to find a reasonable settlement.

EQUIPMENT NEWS

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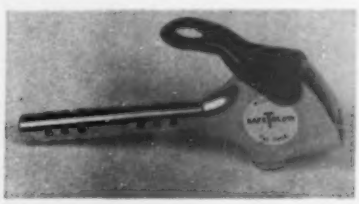
Crane-ladder folds and rolls

Knock it down, haul it anywhere. This combination crane-scaffold-ladder is a maintenance man's dream come true. Versatile Versacrane consists of several independent components that can be used together or separately for inspection and repair work and material handling.

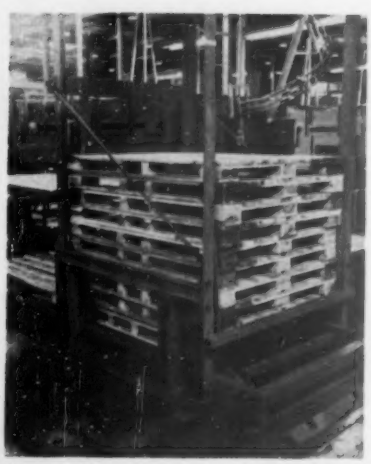
Entire unit collapses for transporting on two platform trucks. These trucks, with 4-position lock and ball-bearing casters, are the basic building blocks. On each can be mounted two independent ladders connected at top by saddle to form mobile ladders. By attaching an I-beam to saddles of two rolling ladders, unit can be converted into gantry crane. A 1-ton chain block adds finishing touch. A Grip-Strut safety platform, with travel from 32 in. above floor up to 12 ft. 2 in., mounts on ladders. All these components are included in the package.

Unlike usual scaffolds, the loaded platform can be raised with chain block. Hooks then attach to ladder rungs and block is released. *W. B. McGuire Engineering Co., Ltd.* (Circle 89)



90—Safety air nozzle cuts pressure for cleaning from 100 psi. at input to under 10 psi. at outlet. Can be placed directly against work surface or man's body without pressure build-up. Eliminates regulators and easy-to-tamper-with controls. *Jet Electronics Corp.*

93—Square fluorescent lamp, with waffle-pattern face, gives concentrated light in small area. Fits into 12-in.-sq. module. Operates at 50 and 80 watts—latter produces 4800 lumens or an efficiency of 60 lumens per watt. Rated life, 7500 hours. Price, $7. *General Electric Co.*



91—Pallet dispenser feeds single empty pallet from pre-loaded magazine. Semi-automatic or automatic operation. Adapts to existing conveyor system; eliminates most pallet handling; reduces pallet maintenance costs; converts to pallet stacker. *H. L. Bushman Co.*

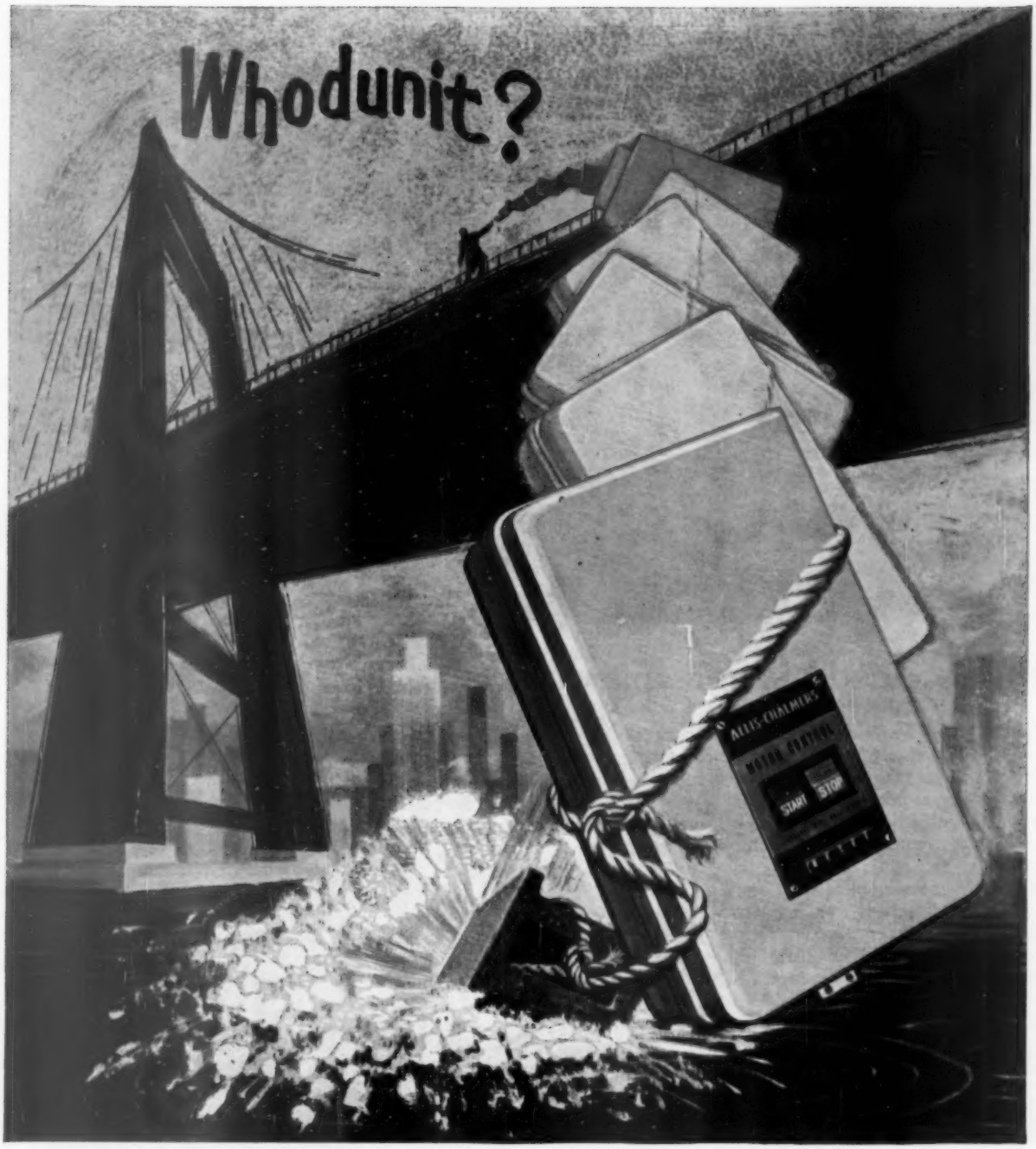
92—Welded steel pallet box, with skid-type legs, nests on top support of underneath unit. One end has expanded metal side for fast identification of contents. Opposite end has sliding gate for feeding to hoppers. Special or 30x36x48-in. sizes. *Hugh J. Baker Co.*

94—Weld flaw detector draws picture of defect on oscilloscope, thus showing exact location and extent of flaw. Eliminates calculations, saves time. Sonoray spots flaws down to 1/16 in.; checks 1 ft. per min. Needs minimum operator training. *Branson Instruments, Inc.*

95—Pipe reducers eliminate multiple connections by providing one-fitting reductions from 1/16 to 1 in. nominal pipe sizes. Units include adapters, bushings, couplings, and nipples. Can be used with pipe schedules 40 to 80 in various metals. *Cajon Machine Co.*

96—Punch press, totally enclosed, insures operator safety. Interchangeable power transmission unit (¼- to 2-in. stroke lengths) can be easily changed in minutes. Needs little maintenance. Foot or hand controls; 3- to 5-ton capacity. Rugged, high precision. *Kenco Mfg. Co.*

Turn the page



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Two years ago, when our engineers designed the bulk out of the Allis-Chalmers low-voltage motor control, they built simplicity into it. And with simplicity came outstanding reliability. Our nation-wide stocks of replacement parts are gathering dust. And warranty returns are negligible.

These controls don't work under water, of course. But they do perform faithfully under practically any other conditions. And they're *still* the most advanced control design in the industry. All sizes from 00 to 9 are available from your A-C distributor. *See him for more facts or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.*

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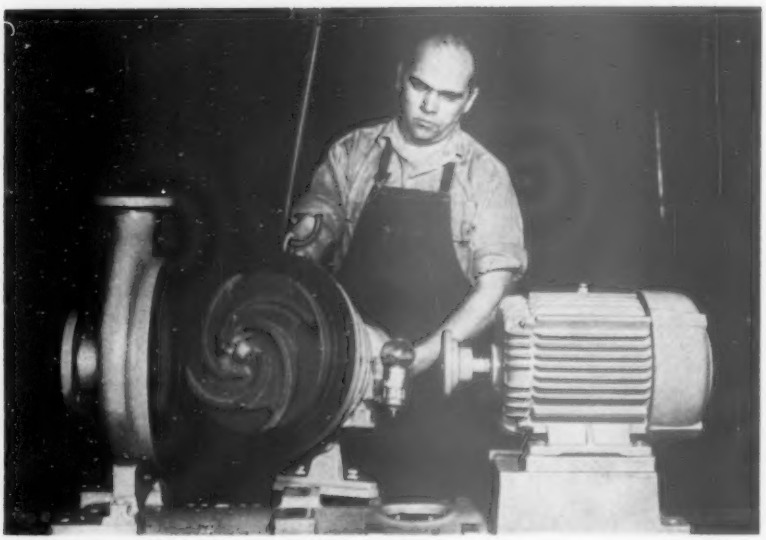

Pump needs fewer spare parts

Reduce your engineering, installation, and maintenance costs with this centrifugal pump. It meets 95% of your process needs. Standardized, interchangeable parts in all 11 sizes will save you money by cutting pump downtime and minimizing parts inventory. The complete unit can quickly be detached from line and replaced by another. One craft disassembles pump without disturbing suction or discharge connections.

Other features that provide interchangeability are: one 23-in. overall length for all sizes, one 1⅛-in. coupling, one dimension from end of suction to centerline discharge, one bolt size and spacing for bases, one spacer coupling length.

Capacity of pump is 5 to 775 gpm., 10 to 300 ft. TDH. Handles −350 to +500 F. liquids at pressures to 275 psig. Comes in ductile iron, 316 stainless steel, Gould-A-Loy 20 and other machinable alloys. *Gould Pumps, Inc.* (Circle 97)

Right-angle motor gives walls close shave

A motor at right angles to drilling axis is what distinguishes this ¼-in. electric drill. Offers operator better tool control, greater working ease in close quarters, less fatigue.

Offset motor permits drilling close to wall or other obstruction parallel to axis. This "in-line" drilling reduces tipping that causes breaking or bending of drill bit. Operator guides "Dirk" with four fingers and thumb. Flat pedestal base bolts easily to bench. Controllable blower keeps work area clean. Has 3-amp. motor, 1800-rpm. speed. *H. K. Porter Co.* (Circle 98)

99—Pocket-size transceiver permits two-way conversation over two-mile range. Cancels out random noise picked up by antenna—ideal for areas with high electrical noise levels. Powered by 1/10 watt—needs no operating permit. Rayette weighs under 15 oz. *Raytheon Co.*

100—Platform truck, with flat bed area of 34.4 sq. ft., has 2000-lb. capacity. "Tug" is 154½ in. long and 51 in. wide, with turning radius of under 9 ft. Powered by 35-hp. engine, it yields 30 mpg. at 30 mph. Parts are easily accessible for maintenance. *Crofton Co.*

101—Silicon d-c power supply comes in 13 ratings from 0.75 to 76 kw. for shop power, elevators, lifting magnets, machine tools, magnetic chucks. Operates at 96% efficiency from one-quarter to full load for units over 25 kw. Wall- or floor-mounted. *General Electric Co.*

102—Portable screw feeder-driver automatically sets screws over 25 ft. away. Compact, lightweight, it uses no moving parts in feeder-hopper mechanism. Adapts to pedal or fully automatic fixed-cycle operation. Uses standard air supply; plugs into 110- or 220/440-volt outlet. Handles up to 2000 size No. 0 to ⅜-in. diameter hex or multiple-spline screws. *Bristol Co.*

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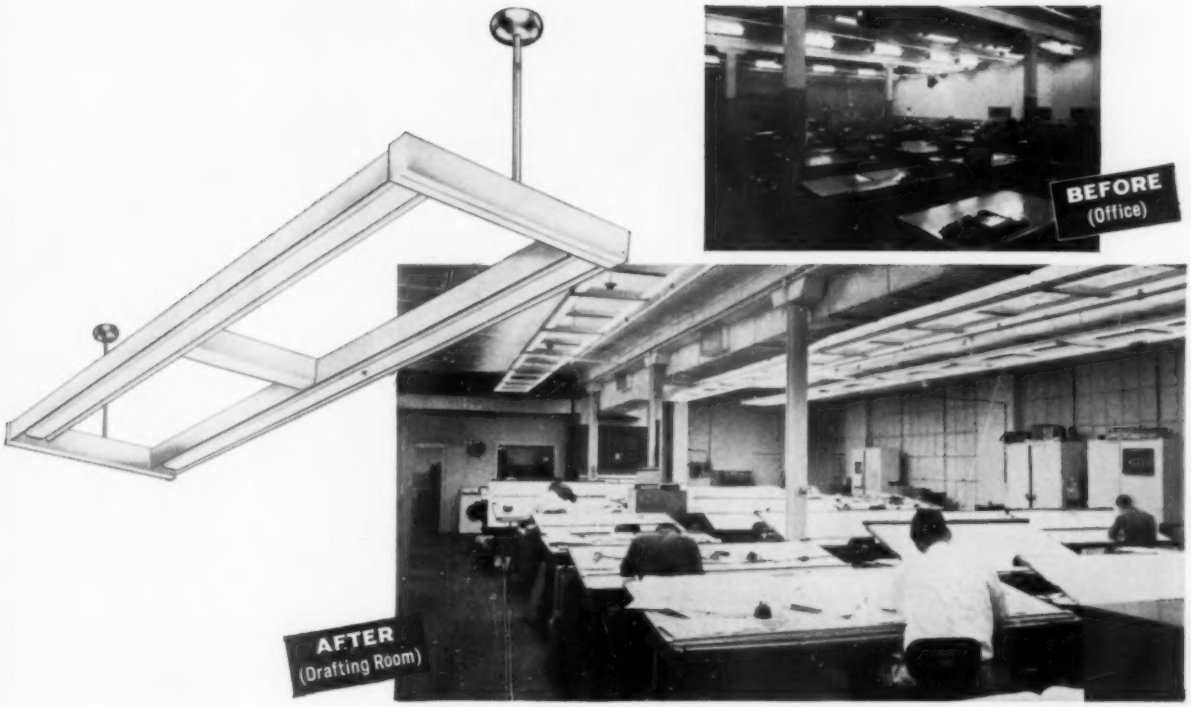

Sylvania's HQ Fixture provides NORGE Division of Borg-Warner **QUALITY Lighting ECONOMICALLY**

The Norge Division of Borg-Warner Corporation in Effingham, Illinois, faced a common problem. They wanted better lighting in their office and drafting room . . . to eliminate shadows and glare . . . to make seeing easier . . . to enable engineers to perform their critical work without cumbersome auxiliary lighting equipment. And they wanted this new illumination system at reasonable cost.

The happy solution—Sylvania's HQ Series fixtures using 1500 ma (VHO) lamps, together with a newly-painted ceiling area. These indirect fixtures with 75% upward component provide 120 footcandles (measured) of well-diffused quality illumination. Glare and shadows are non-existent. The need for supplementary lighting equipment has been eliminated.

Sylvania's fixtures met the final requirement, too. This system of HQ Fixtures cost considerably less than other systems that had been suggested.

The installation at Norge is another example of how, with Sylvania Fixtures, you can choose the lighting fixtures that fit the requirements of *your* job. No *one* fixture meets the requirements of *all* installations. But with Sylvania's fixture line, you can choose the lighting that fits your needs best. And you'll get top-flight performance from every one.

When you want better lighting . . . look into the many advantages that Sylvania offers.

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Mr. A. A. Lindberg, Design Engineer,
Moore Special Tool Co., Inc. states:

"On our Model 1½ Jig Borer...

General Electric Polydyne® Drives Help Us Maintain 0.000070"* Accuracy"

"Efficient control of vibration is the reason that the majority of our Model 1½ jig borers are equipped with General Electric Polydyne drives. Competitive drives have never fully solved this problem," states A. A. Lindberg, Design Engineer for Moore Special Tool Co., Bridgeport, Connecticut.

"Moore tests each Polydyne drive on a specially constructed bracket," continued Mr. Lindberg. "Vibration readings are taken at three points, and every Polydyne drive tested has been under the vibration limit of 0.001 inch and virtually free of operating noise.

"Another reason that our Model 1½ has proved popular is that the Polydyne drive gives an infinite number of operating speeds with just a simple adjustment of the dial to the desired rate."

When your application requires low-cost adjustable speed combined with reliability and ease of maintenance, investigate G-E Polydyne drives. Your General Electric Sales Engineer has full details. Or, write for bulletin GEA-6806, Section 854-06, General Electric Company, Schenectady 5, N. Y.

* Seventy Millionths

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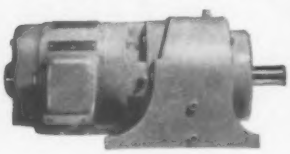
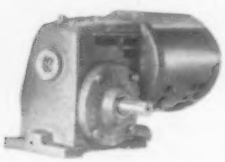
Select from G.E.'s PLUS LINE of compact mechanical power transmission equipment! A full range of ratings is available—many directly from stock.

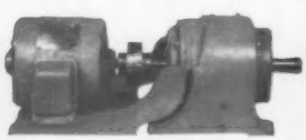
General Electric Polydyne Drive



Integral-type Gear Motor

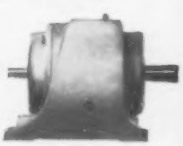


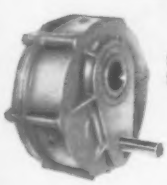
Right-angle Shaft Gear Motor



All-motor Gear Motor

Footed Speed Reducer





Shaft-mounted Speed Reducer

Member of
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GENERAL ELECTRIC

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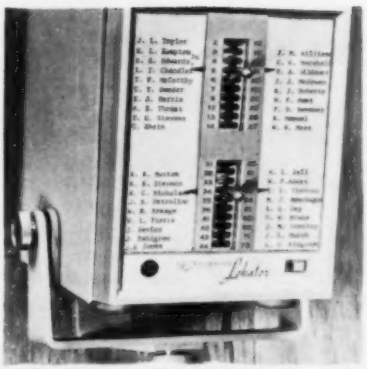
EQUIPMENT NEWS

For more data, circle item numbers on Reader Service Card next to back cover.

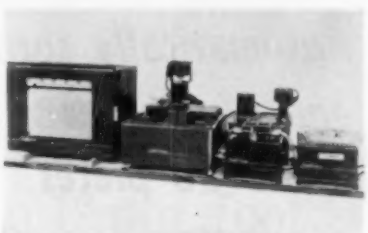


103—Pager offers fast, automatic, private paging of key personnel. Flipping spring-loaded toggle switch opposite name causes coded call number to sound. Lokators can be connected to existing signal networks. In 20-, 40-, 80-call sizes. Economical. *Edwards Co., Inc.*

104—Fire extinguisher, dry-chemical type, weighs only 2½ lb. Easy to operate. Picking up by handle releases safety lock; thumb-operated lever discharges. Simple to recharge. Old cylinder screws out, new one screws in. Price: $11.95. *Walter Kidde & Co., Inc.*

105—Diaphragm pump operates by hand, is self-priming, has suction lift to 25 ft., 1800-gal./hr. capacity. Soil, shavings, chips won't clog if small enough to pass through 2-in. connections. Portable. Two basic models in aluminum, bronze, or stainless steel. *Edison Corp.*

106—Gearmotor weighs only 26 lb., is totally enclosed, fan-cooled, and drip-proof. Reversible output shaft can be transferred to right- or left-hand side of gear unit in field. Available with 1/8-, 1/6-, 1/4-, and 1/3-hp. ratings. *Reliance Electric and Engineering Co.*



107—Analyzer for continuous chemical analysis automatically measures, mixes, purifies, processes, compares, records. Runs 20, 40, or 60 complete tests without human supervision. Monitors and records concentration level of materials in process. *Technicon Controls, Inc.*

108—Uni-mount idler sprockets are bearing-equipped and fully assembled for simple installation on equipment with roller chain drives. Low cost, long life. Precision-machined for smooth chain operation. Oil-impregnated, heavy-duty bearing. *Diamond Roller Chain Co., Inc.*

Turn the page

This large Midwestern wholesale house uses four lines of QIK-TIP sorters to sort 12,000 pieces an hour to 400 destinations. The entire operation is easily done by a crew of 12 people. Further, the company has consolidated the operation of six separate warehouses under one roof and one modern system.

"QIK-TIP" SORTER

Automatically sorts and distributes up to 60 pieces a minute

The QIK-TIP Sortation System brings the advantages of modern, electronic automation to package handling in assembly plants, parts depots, warehouses, terminals and delivery services of all types. It cuts time, labor and the cost of human error to the bone. Here are two installations.

Write for descriptions of other applications or ask for a personalized analysis of your own sorting problem.

SPEAKER SORTATION SYSTEMS INC.

4535 No. 128th. St., Butler (Milwaukee), Wis.

By using the QIK-TIP Sorter, this large automotive parts warehouse increased order-filling speed so that orders are shipped the same day they are received. The stock picker places parts on the color-coded trays which tilt contents into chutes in the background.

Begins on page 96

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

109—Vaportight lighting fixtures prevent premature failures due to weather or corrosive fumes. Decorative finish makes them ideal for breezeways, basements, stairways, building exteriors. Come in 1- and 2-light units; sizes up to 200 watts. *Stonco Electric Products Co.*

110—Sleeve cutting machine automatically cuts paper, twine, nylon, plastics, rubber, glass fiber in lengths of 1/16 to 10 in., from 0.001- to ½-in. diameters. Produces up to 200,000 ¼-in. lengths per hour. Simply constructed, easily adjusted. *Martin Engineering Co.*

111—Washing unit cleans motors, machinery, parts and assemblies, floors and walls. Inexpensive, durable, easy to operate. Mounts on any open-top, 55-gal. drum, comes with wide and narrow spray nozzles. Pressure range from 150 to 175 psi. Non-corrosive. *Dura Corp.*

Turn the page

THERE'S A JOHNS-MANVILLE SPECIFICATION FOR EVERY ROOF INCLINE

Dead level to ½" per ft.
AQUADAM
SMOOTH SURFACE ASBESTOS ROOFS

½" to 6" per ft.
FLEXSTONE
SMOOTH SURFACE ASBESTOS ROOFS

1" to 3" per ft.
ASPHALT GRAVEL SURFACE ROOFS

Dead level to 1" per ft.
AQUADAM GRAVEL SURFACE
BUILT-UP ROOFS

For deck inclines of dead level to 1" per foot:

AQUADAM® GRAVEL SURFACE BUILT-UP ROOFS

Whether gravel is applied by hand as shown below or by the mechanical method you see above... the key word to remember in quoting is AQUADAM. For gravel or slag-surfacing a roof incline of dead level to 1" per foot, over nailable or non-nailable decks, a J-M AQUADAM GRAVEL SURFACE BUILT-UP ROOF specification offers you many advantages.

That's because Aquadam is an unusual bitumen, especially developed by Johns-Manville for use on dead level and low incline roofs. It has exceptional adhesiveness to grip and hold the gravel or slag... and to bond the roofing felts together. Aquadam will wet and adhere to surfacing within a very generous temperature range, and has excellent self-sealing characteristics. Aquadam also offers superior resistance to rain, heat, cold and the thermal shock of sudden change.

You can always quote an AQUADAM GRAVEL SURFACE BUILT-UP ROOF with confidence. You can have equal confidence in the many other specifications available to you as an Approved Johns-Manville Contractor. And, if you come up against *any* specific problem, call your Johns-Manville Representative for free, expert advice. Or, write to Johns-Manville, Box 158, Dept. F-6, New York 16, N.Y. In Canada: Port Credit, Ont. Cable: Johnmanvil.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

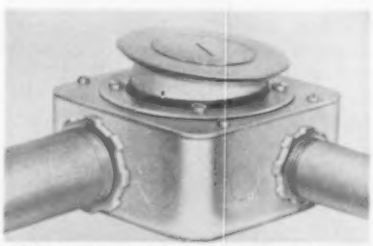
Begins on page 96

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

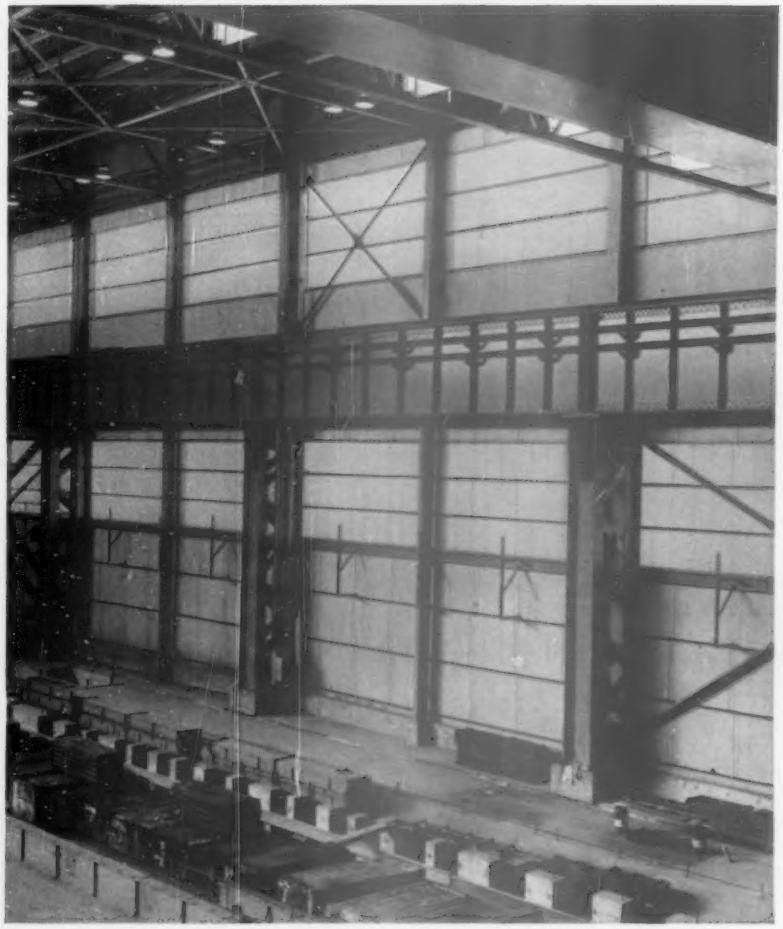
112—Water chillers are for room-by-room control of air conditioning or for supplying quantities of chilled water. About 4 ft. high, units fit in less than 8 sq. ft. of space. Capacities are 17 and 25 tons; weights, 1330 and 1650 lb.; 220 or 400 volts. *Hupp Corp.*

113—Can-drying machine operates on continuous flow principle. Handles cans up to 3-in. diameter—200 per minute. Simple adjustment changes from one size to another. Dried can is ready to label. Connects to existing air and drain lines. *Design & Machinery Co., Inc.*



114—Floor box for concrete floors adjusts up to ⅝ in. vertically, tilts up to 10 deg. in any direction. Flexible gaskets keep it tight, eliminate need for sealing device. Accepts wide variety of standard receptacles. Adjusts after pouring. *The Thomas & Betts Co.*

Turn the page



Shatterproof Structoglas cuts building and maintenance costs for USS United States Steel

United States Steel saved on construction expense and assured years of maintenance-free daylighting by using Structoglas fiberglass windows in this new vertical furnace building. The strong corrugated plastic panels were fastened directly to the steel walls without sash. No painting was required since the light-filtering green tint is "built in." Structoglas is shatterproof and highly weather resistant, so that maintenance is virtually eliminated. Glaze your plant *once and for all* with Structoglas—best plastic panel under the sun. Get the PROOF.*

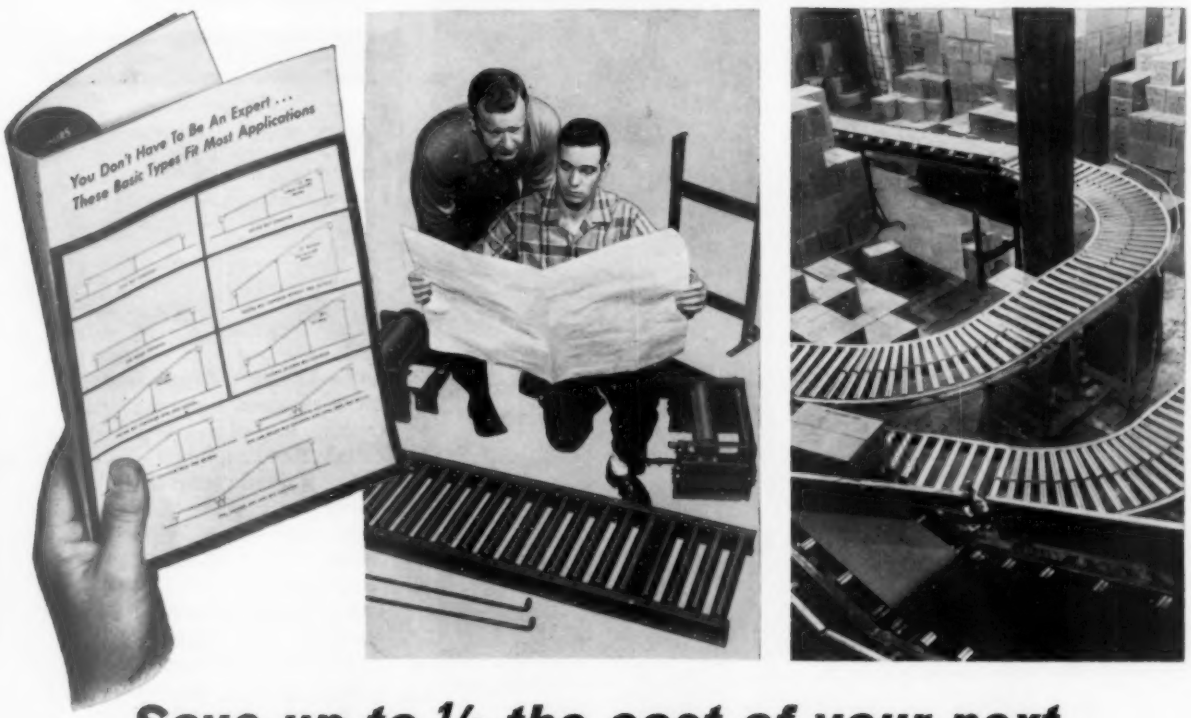
structoglas®

*Write Structoglas Inc., Dept. 703, Cleveland 20, Ohio, for Glazing Folder SL-1, with proofs of Structoglas superiority and glazing details.

GUARANTEED FOR 3 YEARS against dents, peeling, surface chipping and mildew under conditions specified

6007

Read this . . . *Order this . . .* *Install this . . .*



Save up to ⅓ the cost of your next conveyor with Handidrive components

Why pay big premiums for unnecessary custom engineering? Order your next conveyor mail order style . . . right out of STANDARD CONVEYOR'S new *Handidrive* Handbook. Get fast delivery right off the shelf . . . save up to ⅓ the usual cost.

How? Using this valuable new Handbook, you can plan your own installation, order the components you need from factory stock, and then assemble them yourself with simple tools to save on erection costs. And, should you need help, our conveyor specialist in your city will be happy to give free advice on layout, ordering, prices and installation.

In-stock *Handidrive* components include gravity and power roller sections, belt sections, drive units, curves, supports, hangers, tapered sections, guardrails, feed sections, diverters —everything you normally need for an efficient, low-cost conveyor installation.

Moreover, all components are interchangeable to simplify future alteration of your *Handidrive* system to meet changing material handling requirements.

Check these Standard-ized Handidrive "right-off-the-shelf" benefits

- Lower initial cost . . . you buy only what you need!
- Inexpensive to alter or add to.
- Stock items cost us less to build . . . cost you less to buy!
- The most complete line of fully integrated units all from a single source.
- Ready to ship as fast as we can process your order!

Here's the Handbook *that tells you exactly what to do to cut costs with pre-engineered HANDIDRIVE conveyors. Send for your free personal copy now. Just fill in the coupon, attach to your letterhead and mail. Do it today!*

Standard Conveyor COMPANY

Sales and Service in Over 40 Cities
Look in your Yellow Pages under "CONVEYORS"

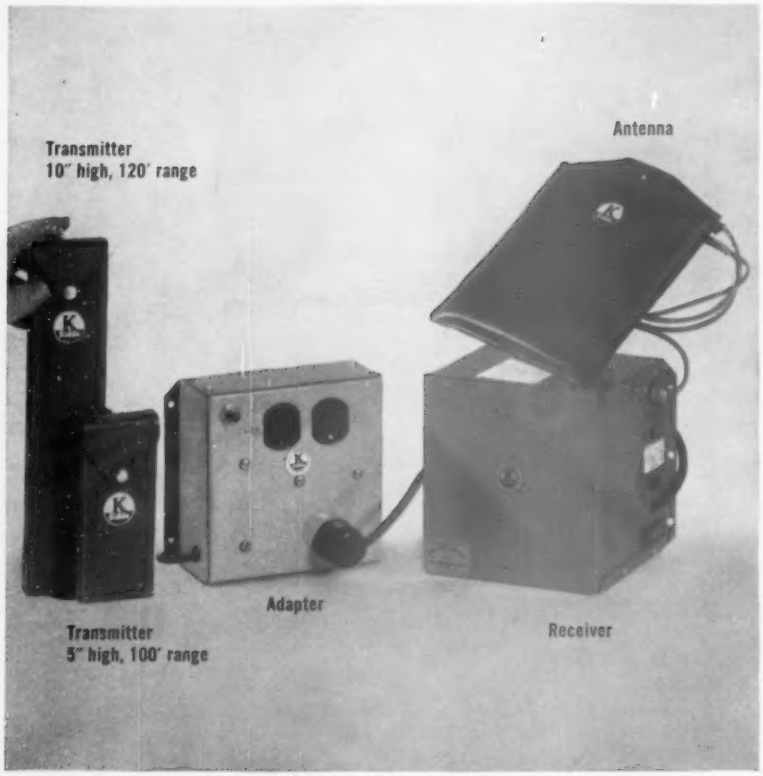
STANDARD CONVEYOR COMPANY
304-G Second St., North Saint Paul 9, Minnesota

Please send me your new HANDIDRIVE Conveyor Handbook.

YOUR NAME_____

YOUR TITLE_____

For more facts Circle 451 on Reader Service Card



Approved by the Burglary Protection Department of Underwriters' Laboratories

New portable alarm in a pocket-sized package!

Sounds alarms • Turns on lights
Closes doors • Reports hold-ups

Brand-new and available from Kidde, Port-O-Larm uses a miniature, pocket-size radio transmitter to signal a fixed receiving unit whenever trouble strikes.

Ideal for use by bank tellers, sales personnel, plant guards or watchmen, the Kidde Port-O-Larm sends a pulsating radio signal to the receiver when the transmitter button is pressed. This causes an alarm to sound either locally, remotely, or at a central alarm station. The device can also turn lights on or off and control other electrical equipment.

Two transistorized transmitters are available. One resembles a slide rule case, is about 10″ long, weighs 15 oz. and has a 120′ range. The other looks like a small portable radio, is 5″ long, weighs 10 oz. and has a 100′ range. For more information on the new Kidde Port-O-Larm, write today.

Kidde

Kidde Ultrasonic & Detection Alarms Division, Walter Kidde & Company, Inc.
732 Brighton Road, Clifton, N. J. • GRegory 2-5000

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EQUIPMENT NEWS

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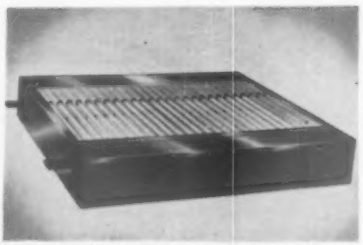
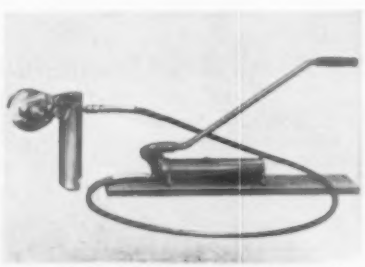


115—Infra-red ovens, furnaces are for high-speed finishing, annealing, brazing, and porcelain enameling of metal. Fluid cooling makes possible compact quartz lamp ovens with extremely high heat transfer rates. Fabricated to meet any specifications. *Fostoria Corp.*

116—Elapsed time indicator for production or office machinery is inexpensive, easy to install and read. Tamper-proof timing device. Records exact operating time. Dial range is 99,999.9 hours or minutes, 1/10 unit minimum indication. *Automatic Timing & Controls, Inc.*

117—Two-way FM truck radio operates on low power. Hand-wired, easy to service, compact. Fits under dashboard. Can be removed, and interchanged from vehicle to vehicle without use of tools. All-aluminum construction. Three-channel maximum. *Aeronautical Electronics, Inc.*



118—Portable hydraulic cutter needs no outside power source, can be taken anywhere. Cuts soft metals up to ¾-in. in diameter, medium-hard metals up to ⅝-in. diameter. Cuts over-head, on floor, or in confined areas. Other heads are available. *H. K. Porter, Inc.*

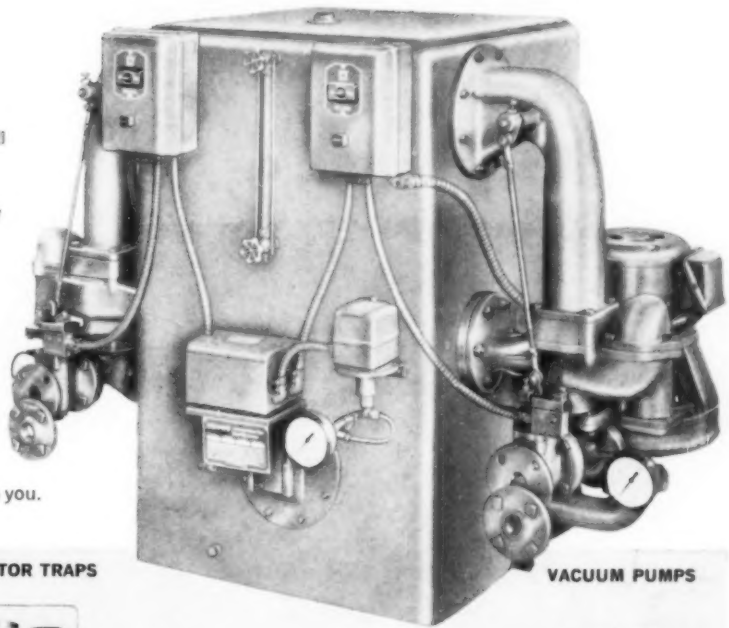
Turn to page 111

DUNHAM-BUSH

. . . the 1 manufacturer of THESE STEAM HEATING SYSTEM ESSENTIALS

WHAT THIS MEANS TO YOU . . .

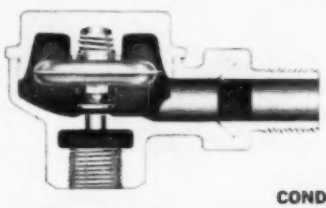
It means a "matched set" for the "heart" of every steam heating system . . . radiator traps . . . float and thermostatic traps . . . vacuum pumps, as well as radiator valves, strainers and condensate pumps. It means complete product dependability through one manufacturer backed by more than 50 years of design and manufacturing know-how. It means economy. It means quicker delivery. It means one order Instead of many. It means easier installation. Only Dunham-Bush can mean these many things to you.



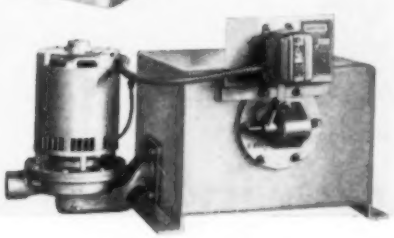
VACUUM PUMPS

FLOAT AND THERMOSTATIC TRAPS

RADIATOR TRAPS



CONDENSATE PUMPS



Designed and time proven to give equal satisfaction under conditions of 25" vacuum to 15 lb. pressure. Use of Dunham-Bush F & T traps on vacuum returns, condensate pump or subatmospheric control systems is assurance of proper system operation.

Simplified, rugged design is the result of Dunham-Bush's 57 years of experience as the leading manufacturer of thermostatic traps. Large valve opening plus unique design of flat floating valve with rounded seat provides freedom from clogging and wear.

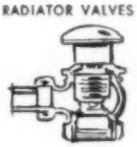
Dunham-Bush offers single and duplex pumps through 65,000 EDR equipped with magnetic starters and controls, mounted and wired to eliminate extras. Features include: low inlet connection for returns; capability of producing 26" vacuum at low amperage; only one principal moving part; one motor to handle both air and condensate. These outstanding features mean lower initial cost, lower installation cost and lower maintenance cost.

F & T TRAPS

BUCKET TRAPS

STRAINERS

RADIATOR VALVES



Request Bulletin:
1501C (Steam Heating Specialties)
1401B (Vacuum Pumps) and
1403A (Condensation Pumps)
for full details

DUNHAM-BUSH

DUNHAM-BUSH, INC.

WEST HARTFORD 10, CONNECTICUT, U. S. A.

SALES OFFICES LOCATED IN PRINCIPAL CITIES

For more facts circle 453 on Reader Service Card

"On the waterfront...

it's 8:22 p.m. . . . the ship is loaded . . . sailing time is dawn tomorrow. We loaded 2,200 tons of cargo in her hold today, starting at sun-up. Tomorrow there'll be another ship . . . another day of lifting, hauling, storing.

"When you work like that from day to day, you need a truck that can stand the gaff . . . you need a truck that can handle the load with ease and put it where you want it—fast. You need a Clark to work with."

CLARK® EQUIPMENT

Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek, Michigan

For full details,
see your local Clark Dealer
or circle 77 on reader service card

Any way you look at Roebling Royal Blue Wire Rope, there's real savings in it for you. In its inner and outer uniformity. In its *extra*-high strength. In unison, these qualities provide unrivalled resistance to abrasion, impact, crushing and tough sheave pressures. Royal Blue—inside and outside—goes on paying off for you when lesser wire rope would need replacing. Find out more from your wire rope distributor, or write for free booklet to Roebling's Wire Rope Division, Trenton 2, New Jersey.

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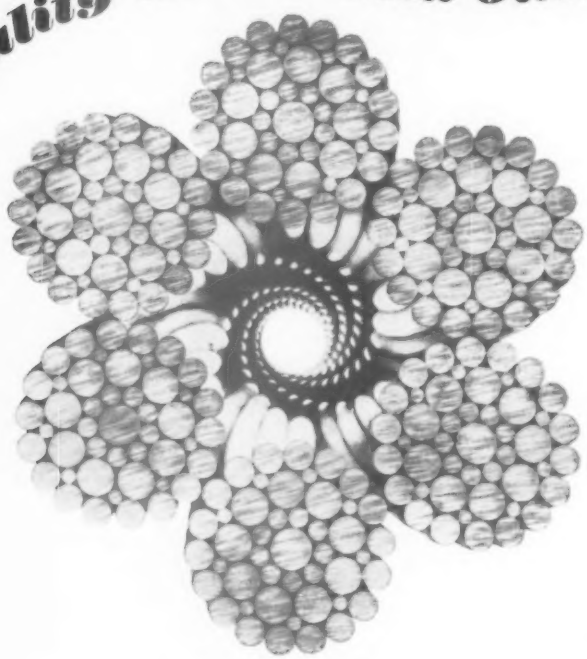
quality inside and outside



We put a lot of work into it—
You get a lot of work out of it

For more facts circle 454 on Reader Service Card

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EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

119—Lift truck, 5000-lb. capacity, is maneuverable and powerful despite small size. Comes with 180-in. triple-lift mast and side-shifting carton clamp. Operator has full vision to within 12-in. of fork heels for greater unloading speed and safety. *Towmotor Corp.*

120—Centralized lubrication system operates by hand, and lubricates up to 15 points at once. Each fitting has individual flow control. Delivers pressures up to 200 psi. Reservoir of 2-cu.-in. capacity holds lubrication for 1300 injection cycles. *Walker Mfg. Co.*

121—Remote metering device permits precise readings of liquid meters up to ½ mile from meter itself. Operates without external power supply. Read-O-Matic is powered by a self-contained generator in meter to which it's attached. Economical. *Badger Meter Mfg. Co.*

Turn the page

1. INSTALL MACHINERY FAST
2. LEVEL 3. LICK VIBRATION

NEW LEVEL-RITE SERIES 500

Cut machinery installation time and costs up to 70, 75, even 80% . . . eliminate transmitted vibration up to 85%! That's the money-saving move with Level-Rite Series "500" — latest member of the Unisorb family. No lagging, no cement, no drilling, no "hit or miss" spotting is needed. Unisorb Level-Rite mounting is fast — machines can be moved and relocated quickly and with a minimum of downtime.

Level-Rite Series "500" is a self-contained leveling mount for light and medium duty machine shop tools. It withstands weights up to 750 lbs. Send for literature.

SPECIAL ADVANTAGES: Fast, simplified, precise leveling • Free-floating screw post — compensates for uneven floor • Safe, sure grip — can be cemented if needed • Lowers noise level — increases worker efficiency • Better machine performance (improved alignment) • Available in many types and thicknesses for all machine types • Money-back trial is yours for the asking.

FEO-62

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Please send literature on Unisorb Level-Rite "500" ☐

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THIS
IS
WHY

Chromcraft

prefers the
ALLIS-CHALMERS

FT-20

More Power at the Drive Wheels

The FT-20 is the most powerful truck in its class. The extra power pays off every day on the steep ramp at Chromcraft Corporation in St. Louis.

Better Stability

Sometimes it is necessary to carry a load high to clear machines and materials. Balance and low center of gravity make the FT-20 first choice for this work.

Much Easier to Maneuver

The loading dock is narrow and busy at Chromcraft. Lift trucks must also work inside boxcars. The FT-20 can scoot and squirm through areas where smaller, less powerful, less maneuverable trucks can't follow.

Ask your Allis-Chalmers dealer to show you further proof that there's a Dollar-Saving Difference in Allis-Chalmers lift trucks. Allis-Chalmers, Milwaukee 1, Wisconsin. BH-165

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

POWER
FOR A
GROWING
WORLD

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EQUIPMENT NEWS

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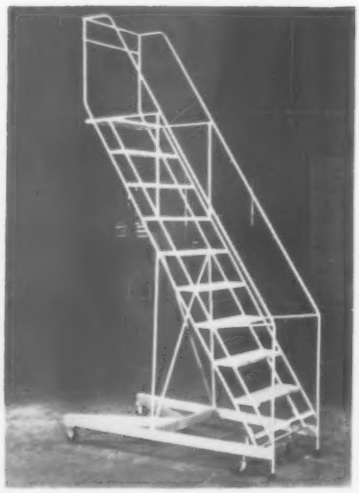
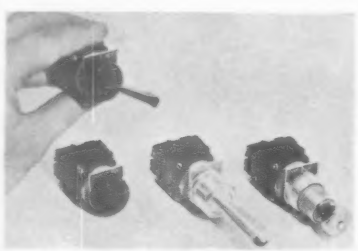


122—Safety ladder makes it possible for one man to work without moving furniture or machinery. Ideal for offices and plant. Cantilever construction allows upper portion to get closer to work. Caster-mounted base rolls under desks or equipment. *The Ballymore Co.*

123—Motor for textile industry operates free of lint, is fan-cooled, totally enclosed. Type JG is available in ratings from 1 to 50 hp.; speeds, 720 to 1800 rpm. Fast heat dissipation. Operating voltages of 220/440 or 550 volts. *U. S. Electrical Motors Inc.*



124—Miniature pushbuttons have building-block construction with separable operators, contact blocks, rings, selector switch knobs. Units include wobble stick operator, bat lever selector switch. Economical—many combinations are possible. *General Electric Co.*

Turn the page

Meet a
Member of
the Ground Team
at
Boeing

Precision and efficiency are essential at Boeing. In material handling, hundreds of thousands of items must move, smooth as silk, through the 603-acre Wichita plant until they emerge on the flight line as a sleek B-52H. A fleet of Allis-Chalmers lift trucks lends a hand on every part of this smooth operation — from receiving dock to flight deck. Their record of performance is convincing evidence that there *is* a Dollar-Saving Difference in Allis-Chalmers lift trucks. Let your dealer tell you about it. Allis-Chalmers, Milwaukee 1, Wisconsin. BH-167

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

POWER
FOR A
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WORLD

Circle 456 on Reader Service Card

Circle 457 on Reader Service Card

"MAN YOUR ENJINE, LADS- THAT'S OUR MARK!"

In many ways the people at Markem are a lot like the gentleman who invented the fire mark of the mid-1800's. His task was to devise some immediately recognizable, low cost and long-lasting means of identifying a home or building according to the company that insured it. We constantly look for and develop methods of identification with these basic advantages and others as well, to help the products of every industry speak for themselves — in the most practical way for the least possible investment by the manufacturer.

The old volunteer fire brigade looked for the mark of their own company, and if it wasn't there they often let the building burn; it wasn't their job to put out "other people's" fires. The people who buy, utilize or service the product or part *you* make look for your name, the product's specifications, content or other descriptive data. Since you put the identification there for their benefit *and* yours, doesn't it make sense to do the *best possible job* — to make it as *easy to understand, complete, durable* and *attractive* as you can at the lowest possible *cost?*

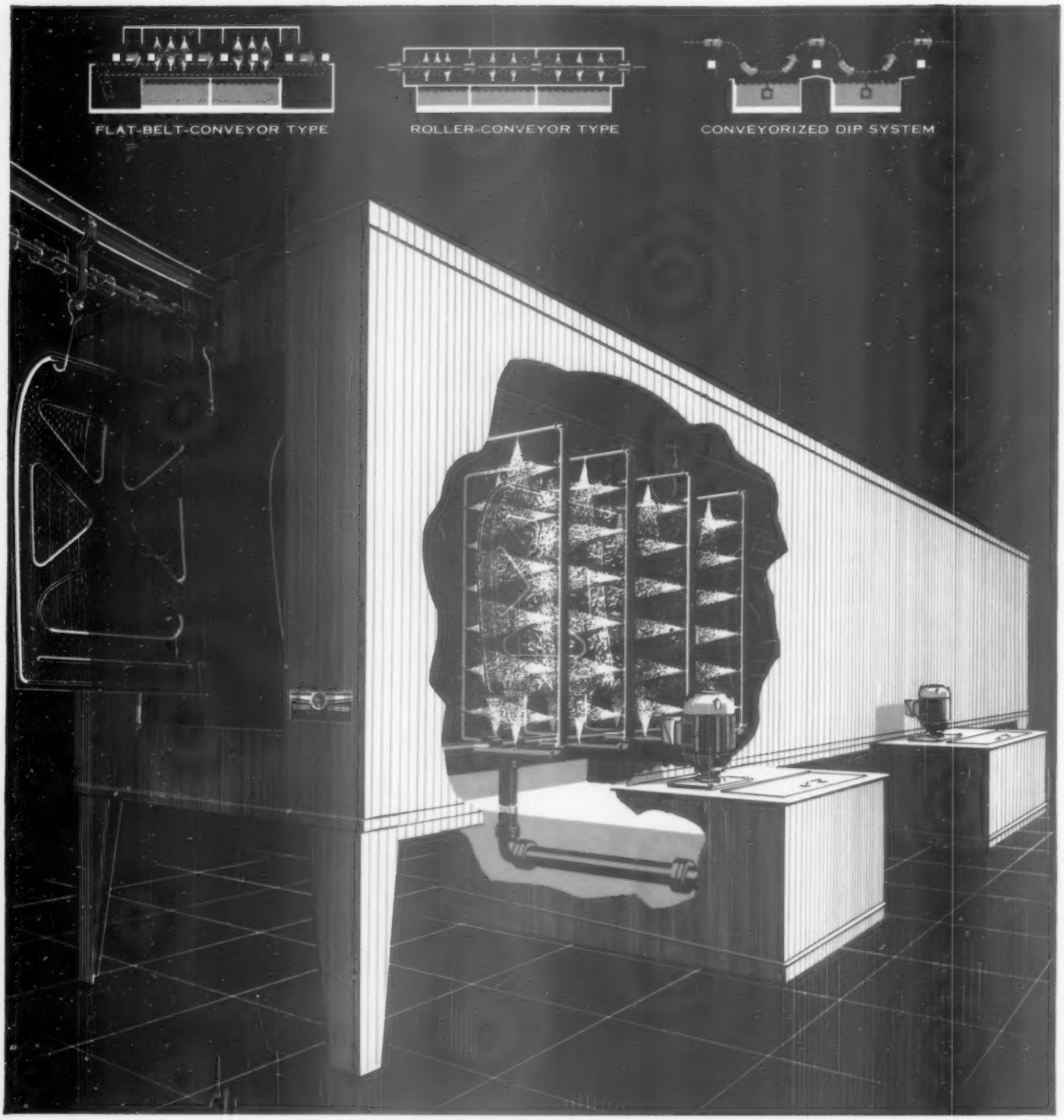
Just putting a label, decal, tape or mark on your product and letting it go at that may be selling short the real abilities of good identification. In contrast, the *one* combination of method, machine, type and specialty ink carefully chosen for the needs of *your* product will gain every advantage for you. It's our business to know which combination *is* best for your needs — and our responsibility to see that it works to your satisfaction.

Call us and see whether we can make a marked improvement in your product identification, and in the cost as well. Write Markem Machine Co., Keene 18, N. H.

MARKEM

HELPS YOUR PRODUCT SPEAK FOR ITSELF

For more facts Circle 458 on Reader Service Card



power spray washers from DeVilbiss for metal cleaning and surface preparation are offered in both standard and custom designs to meet your exact operating problem. We work closely with your engineers to match machines to cleaning processes, surface treatments, and production requirements — to assure highest efficiency. Engineering, installation, and service facilities are available from coast to coast.

Talk to DeVilbiss about all your metal cleaning and treating needs

FOR TOTAL SERVICE, CALL
DEVILBISS

THE DeVILBISS COMPANY, Toledo 1, Ohio. Also Barrie, Ontario; London, England; São Paulo, Brazil. Branch offices in principal cities.

For more facts Circle 459 on Reader Service Card

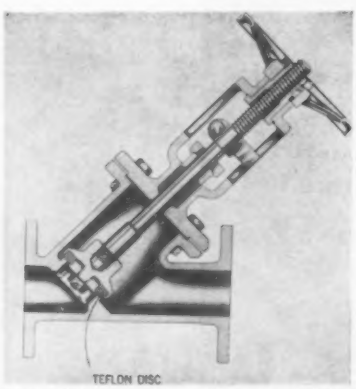
Begins on page 96

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

125—Load interrupter switch for metalclad switchgear switches up to 1200 amp. Closes on 60,000 amp. when fused, 40,000 amp. when not. Nominal voltage ratings are 4.8, 13.8 and 14.4 volts. Meets latest National Electric Code requirements. *S & C Electric Co.*

126—Ear protectors for safety caps give high degree of protection with maximum comfort. Simple fittings allow quick, easy attachment to most caps. Approved for use in construction, pulpwood, and metalworking. Communications model is available. *David Clark Co., Inc.*

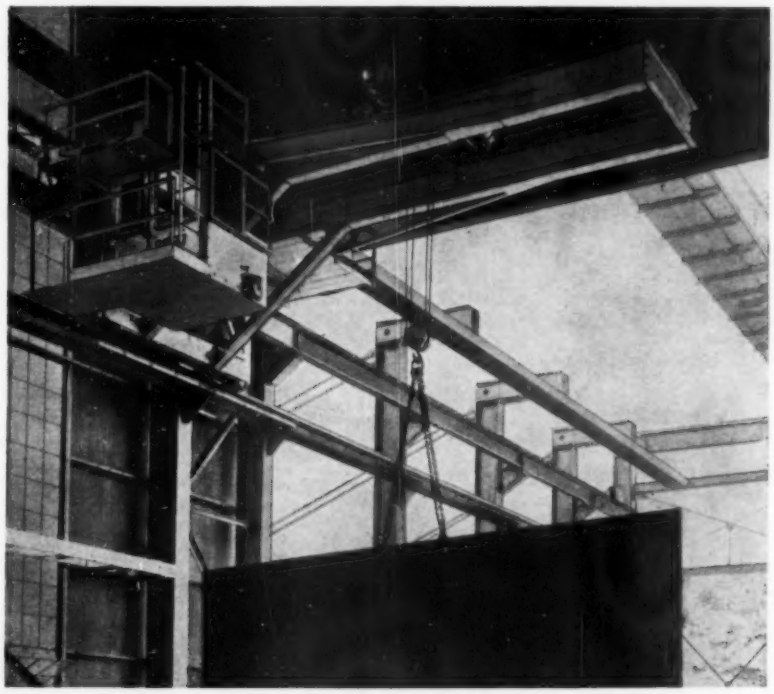


127—Globe valve has non-rising handwheel, non-rotating stem, and fixed disk. Good for chemical and food industries. Stem doesn't vibrate, won't cut through packing. No galling between stem foot and disk. Sizes begin at 2 in. Non-corrosive. *Alloy Steel Products Co.*

Turn to page 118

SHEPARD NILES JOB-MATED CRANES:

DIFFERENT—because each job is different



Shepard Niles Cab Operated Wall Crane

This Shepard Niles Job-Mated QUALITY Crane was specifically designed for the actual job it is doing. Each component – motors, controls, frame, gearing, trolleys, brakes – was designed and built by Shepard Niles to give the best overall crane performance under unique operating and load conditions.

Your load-moving problem will receive this same careful consideration at Shepard Niles. Even in so-called "standard" applications, our insistence on selecting the right components to meet exact on-the-job conditions, results in a custom-built crane. Care like this in our plant means lower operating costs and increased efficiency in yours.

For the full story on how Shepard Niles Job-Mated Cranes can cut costs in your plant, arrange to have a Shepard Niles representative call at your convenience. Or send for our descriptive bulletin.

Member of Electric Overhead Crane Institute

America's Most Complete Line of Cranes and Hoists

SHEPARD NILES
CRANE AND HOIST CORPORATION

3368 Schuyler Ave., Montour Falls, N.Y.

For more facts Circle 460 on Reader Service Card

Otis

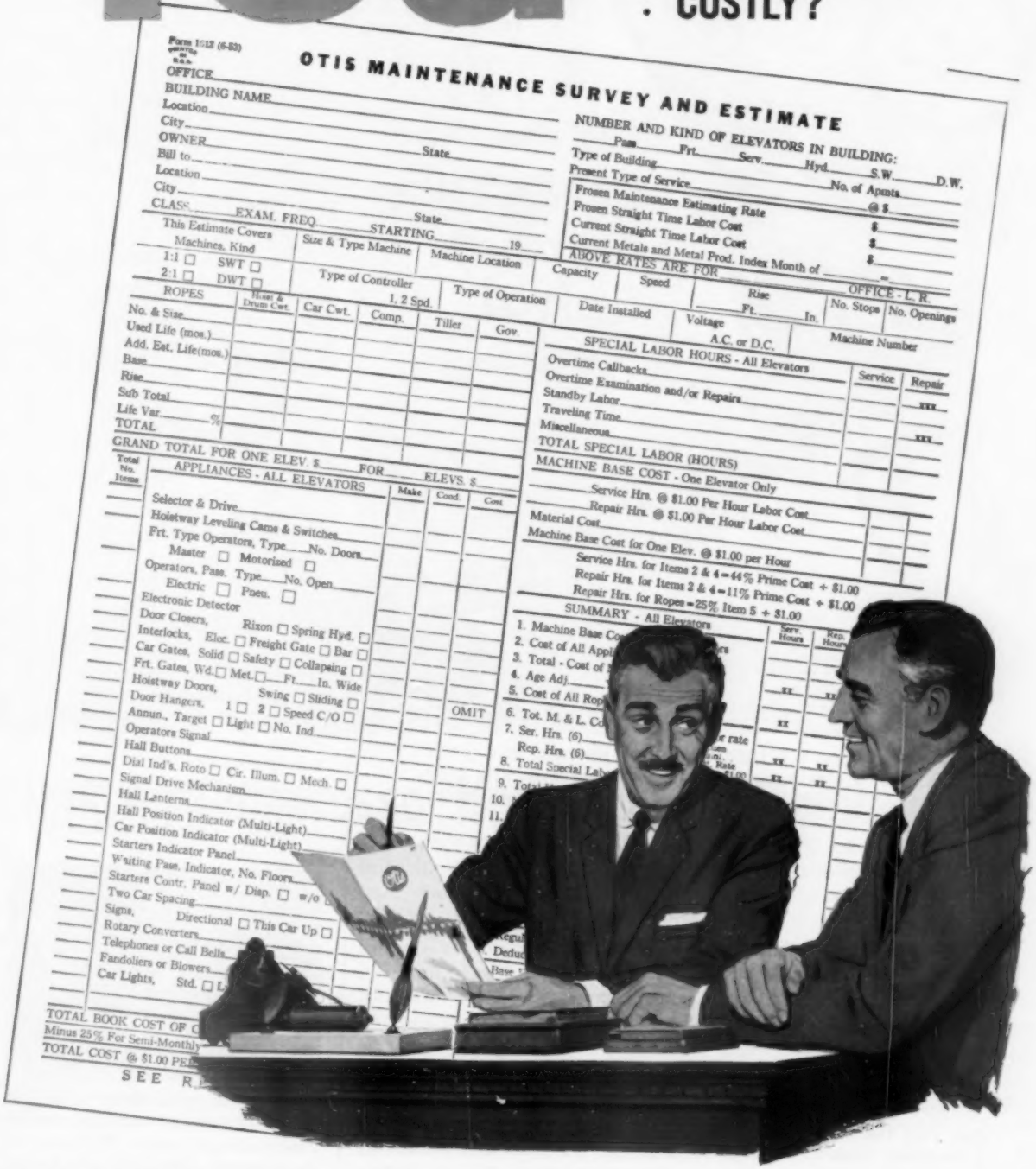
IS ELEVATOR MAINTENANCE COMPLEX?

YES! It is an organization task requiring an unusual combination of skills. Plus a wide knowledge of parts, assemblies, functions, replacement procedures, testing and adjusting. Plus the availability of original replacement parts. Plus immediate local service in emergencies.

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.
OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

You

IS YOUR ELEVATOR MAINTENANCE COSTLY?



HOW DO YOUR COSTS compare with professional elevator maintenance? OTIS can figure your costs accurately. We can tell you why it will pay you to have OTIS keep your freight elevators running like new. We can reduce your shutdown costs. We can eliminate unexpected repair bills. We can hold your costs to one fixed monthly charge. Why not ask your local OTIS man for a FREE Maintenance Survey and Estimate. Then let the figures decide!

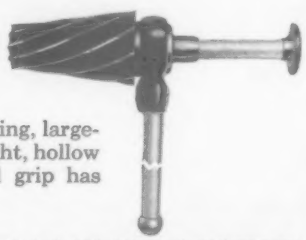
World's Fastest, Smoothest Hand Reaming

Self-Feeding RIDGID® No. 2-S Spiral Reamer

. . . reams pipe, conduit, sheet metal and wood!

Try a RIDGID Spiral Reamer, and you'll quickly feel how it reams its way into pipe, conduit, metal holes or wood without effort. Heat-treated cutting edges give maximum service life. Ratchet-action handle makes work easy in close quarters.

Now Available . . .
RIDGID No. 254 Spiral Reamer
for 2½" to 4" Pipe and Conduit



No more hand filing . . . here's the time-saving, large-size hand reamer you've always needed. Light, hollow construction makes handling easy. Hand grip has large butt plate for body pressure.

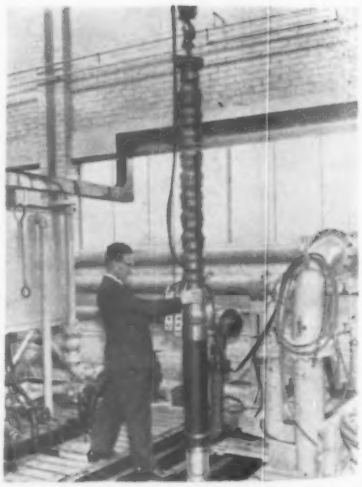
Call your Distributor today. For your convenience, he maintains a complete stock of RIDGID Work-Saver Pipe Tools and parts!

RIDGID®
The Ridge Tool Company, Elyria, Ohio, U.S.A.

Begins on page 96

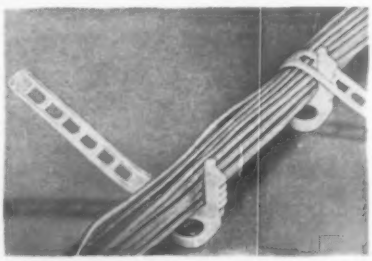
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.



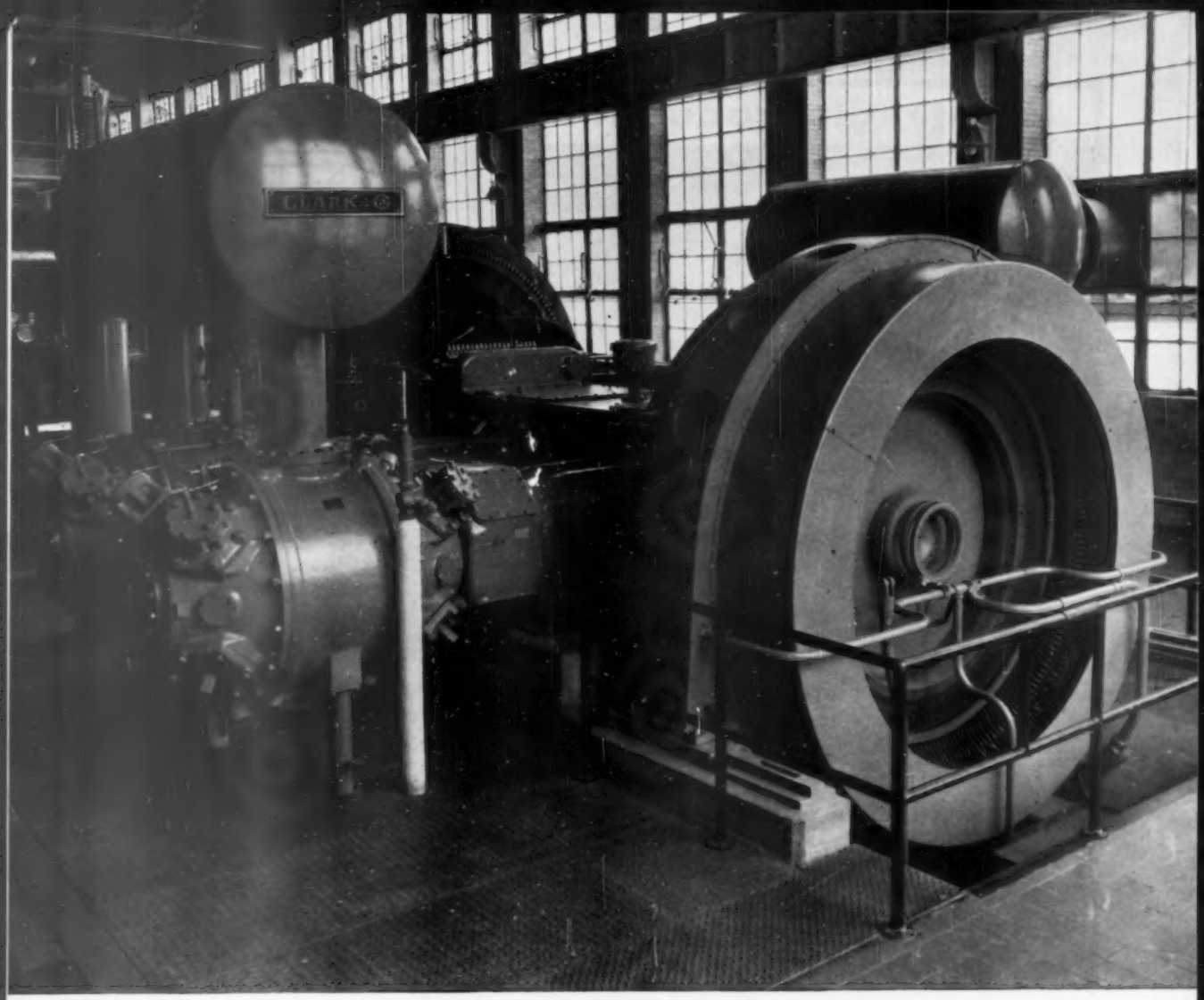
128—Submersible pump for industrial water supply uses bronze bowls and impellers, stainless steel shaft to resist corrosion. Available in sizes from 10 through 50 hp., 150 through 550 gpm. capacity, in three basic impeller sizes. High efficiency. *Sumo Pumps, Inc.*

129—Air drier is fed directly from air compressor tank at up to 150-psig. pressure, and cools air to slightly above freezing point. Condensed moisture leaves through automatic discharge trap. Handles 10 scfm. at 100 psig. Plugs into 115-volt outlet. *Zeks Industries, Inc.*



130—Nylon cable clamp is for fast, easy clamping and handling of bundles or single cables. Requires no tools, opens easily for adjustment, removal, or addition of wires. Withstands vibration up to 20 G. and shock up to 120 G. Re-usable. *Weckesser Co., Inc.*

Turn the page



Clark Air Compressor Keeps Lid On Maintenance!

Just Plain Dependable—That's the only way to describe this 2000 bhp Clark CBA-4 Balanced/Opposed Compressor. Ten years ago it was installed in the assembly plant of a major Detroit automotive manufacturer. To date, there has been no forced downtime other than scheduled maintenance overhauls.

On Duty 16 Hours a Day, five days a week, the compressor operates as a base load machine supplying 10,000 cfm of air at 105 psi. This is rated at 8% of total plant air utilized to operate the assembly line, paint shops, glass plant, blast furnaces and other functions.

Under a Preventive Maintenance Program, the compressor is overhauled once every two years. After 10 years of service, the valves are still original equipment. Bearings are also original equipment and have required no maintenance since startup.

Besides this Trouble-Free Performance, the user is on the "plus" side in many other respects. Among them: Smooth operation achieved by Clark Balanced/Opposed design; compactness that saves floorspace; simplified, reduced foundation requirements; inherent accessibility; marked simplicity of design.

Covering a Range of 75-8000 BHP, the Clark Balanced/Opposed, Motor-Driven line is increasingly becoming industry's preference for plant air requirements. Complete details are obtainable in Bulletin 185. Write now for your copy or get the facts first hand from your nearest Clark representative.

ROOTS CONNERSVILLE — *Blowers, Compressors, Gas Pumps, Rootsmeters, Vacuum Blowers*

Working together in allied industries . . .

PODBIELNIAK — *Centrifugal Contactors, Distillation Apparatus, Instrumentation*

CLARK

DRESSER INDUSTRIES INC.

OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

CLARK BROS. CO.

OLEAN, N. Y.

Engines • Compressors
Gas Turbines

Want high production . . .

and low maintenance too?

PAYLOADER® users say:

"Our H-25 has proved to be a real workhorse — ruggedly constructed for continuous dependable production" . . . "The maintenance on our two Model H-25's has been lower than on any loader previously used" . . . "H-25 gives maximum production output under ideal or adverse conditions."

All PAYLOADER tractor-shovels are not exposed to dusty, dirty conditions, but many are, so Hough engineers take extra effort to design maximum protection into all PAYLOADER models.

For example, this Model H-25 has dual-filtering of engine intake, individual cartridge-type filters on all three oil systems — for the engine, the hydraulics, and the torque-converter/power-shift transmission. Service brakes, hydraulic system, generator, distributor and ignition and starter switches are all sealed. Parking brake is enclosed. In addition, more than 100 "O" rings and other seals are used on the hydraulic and mechanical systems to keep oil and grease in and dirt out.

Whatever size of PAYLOADER tractor-shovel you need, you can be sure it is designed with this same attention to production insurance. Your Hough Distributor will gladly show you how these high-production and low-maintenance features can "ease the profit squeeze" of your bulk handling.

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THE FRANK G. HOUGH CO.
755 Sunnyside Ave.
LIBERTYVILLE, ILLINOIS
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7-A-2

Begins on page 96

EQUIPMENT NEWS

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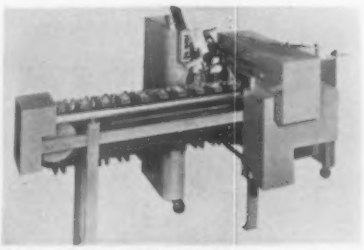
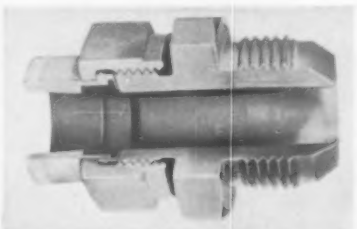


131—Automatic cartoner packages tubes, bottles, gasoline caps, film, ball bearings. Requires only one operator, produces 72 packages per minute. Easy to service and adjust. Size: 109x54 in.; weight, 950 lb. Caster-mounted. *Crompton & Knowles Packaging Corp.*

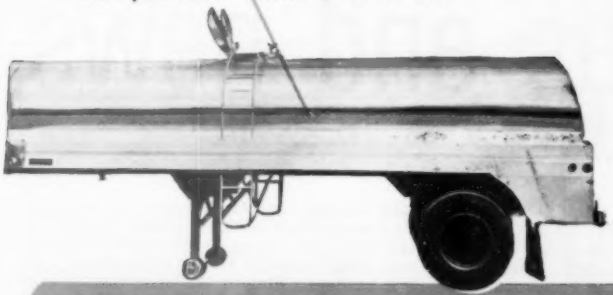


132—Rigid tube coupling maintains seal under vibration, shock, pressure overloads, pulsing action, or temperature variations. Will withstand 5000-psi. hydraulic impulse pressure cycling with 7500-psi. peaks. Available in sizes from 3 through 24. *Resistoflex Corp.*

133—Portable air compressor will work continuously on medium production job. Will handle high-production intermittent-type spray gun. Comes in four models, gasoline or electric. All provide operating pressures of from 70 to 80 psi. and have 15-gal. tanks. *Binks Mfg. Co.*

Turn the page

the product milk tank trailer



INCREASED OUTPUT PAYS FOR RETOOLING PROGRAM IN 58 DAYS...

NETS $58,000 DIVIDEND/YEAR!

Inefficient and outdated power tools were costing this plant money. A power tool study revealed that in the assembly of tank trucks alone, 29 out of 66 tools were operating at only 40 to 50% efficiency.

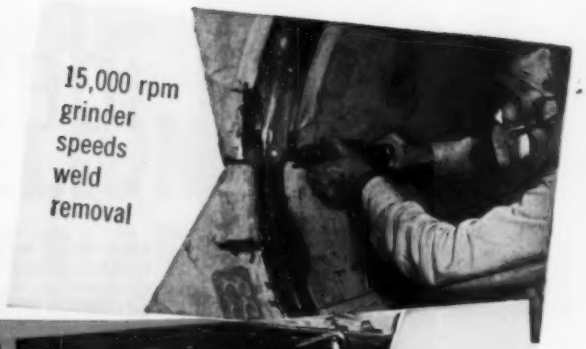
New, more efficient Ingersoll-Rand Air Tools with full power and speed replaced the old tools. Fifteen additional I-R tools were installed to cut fabrication time on other operations. Leaks, faulty oilers and air filters were corrected. The net result: increased production that amounted to a $58,000 Dividend on Payroll Dollars the first year.*

With production increases making up the full cost of the tool replacement program in just 58.6 working days, an immediate Planned Annual Retooling program was started to maintain peak tool efficiency and maximum output.

A power tool study in your plant can more than likely show how you can reduce your costs through increased output per man with more efficient tools.

*For details, call your I-R AIRengineer or write Ingersoll-Rand, 11 Broadway, New York 4, N.Y.

216A-8

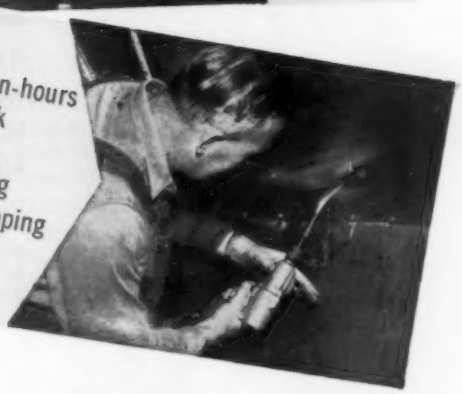


15,000 rpm grinder speeds weld removal

Angle wrench triples output here

Bolt assembly time cut by 67%

Impactool cuts die changing time in half

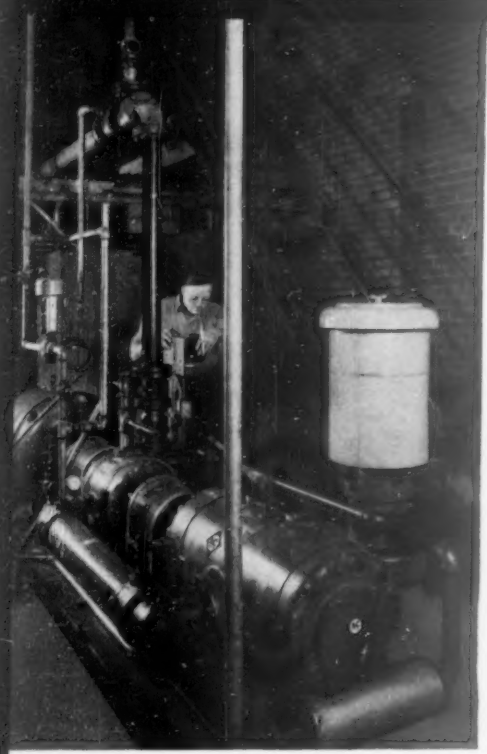


5 man-hours a tank saved running self-tapping screws

Ingersoll-Rand

Planned Annual Retooling increases output per man

For more facts Circle 465 on Reader Service Card



ideas and news

More air . . . less wear, with vibration-free compressors: RO-FLO compressors with sliding-vane rotary design eliminate operating losses inherent in reciprocating machines. Centrifugal force keeps vanes in close contact with cylinder walls, automatically compensating for wear. In addition, fewer moving parts result in less wear, reduced maintenance costs.

New control centers designed for savings: You save space, simplify wiring, reduce inspection and maintenance expenses with new Allis-Chalmers low-voltage motor control centers. Plug-in terminal blocks and drawout construction cut inspection time by speeding withdrawal or removal of units. Pushbuttons and pilot lights mounted on the removable frames eliminate failures common with hinged wiring. Special connectors prevent loosening of bus connections.

New transformer cuts installation costs: Allis-Chalmers lightweight, dry-type transformers can be mounted in half the time of ordinary types . . . as easy as installing a wall switch or an up-to-date motor starter. Simple procedure: fasten the dry-type panel to the wall, install the coil/core section, and attach the front panel. No special hookup cable needed, thanks to a low temperature-rise level. These compact, wall-mounted units weigh 35% less than conventional designs. In addition, advanced A-C dry-type transformers incorporate every known factor in noise-level control, for quiet operation. Designs rated from 3 to 25 kva.

Which one of these productive ideas could be working for you?

Compressors that defy wear . . . transformers that cut installation costs . . . advanced control centers. These examples demonstrate the extra value that is standard with A-C . . . the greater efficiency and added productivity which are yours when you buy A-C products, systems and services. Call your A-C representative or distributor for details on A-C "worth-more" features. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS PRODUCTS FOR INDUSTRY: compressors, controls, coolers, crushers, earth-moving equipment, engines, generators, industrial systems, kilns, lift trucks, mills, motors, pumps, rectifiers, screens, switchgear; thermal, hydro and atomic electrical generating equipment; transformers, unit substations.

A-1470

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS

For more facts Circle 466 on Reader Service Card

Begins on page 96

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

134—Hydraulic pallet trucks, for low-lift work, come to fit your needs. Available in 2500- and 4500-lb. capacities, 20½- and 27-in. widths, 36-, 42-, and 48-in. fork lengths. Have rubber or steel wheels. Special polyurethane wheels are optional. *The Prime-Mover Co.*

135—Carton clamps give maximum protection of cartons in palletless handling. Clamping force is instantly and uniformly transferred over entire clamping surface of load. Contact surfaces remain parallel at all times, eliminating awkward handling. *Cascade Mfg. Co.*

136—D-C microvolt-ammeter and amplifier measures extremely small d-c voltages or currents. Has 15 voltage ranges—from 1000 volt to 100 micro volts; 10 current ranges —from 1 amp. to 1 milli-micro amp. Accuracy of ±3% on all ranges. *Cohu Electronics, Inc.*

Turn the page

THREE BILLION DOLLAR VOTE OF CONFIDENCE

in the future of OHIO

To keep pace with Ohio's dynamic growth, the state's eight investor-owned electric power companies will spend three billion dollars in the coming decade to double capacity. As much new generating capacity will be provided in the next ten years as was built in the past seventy-five.

If you are seeking a plant site, these facts are important for two reasons. First, this is solid indication of the confidence electric utilities have in Ohio's future growth. Second, you can be sure there will be plentiful, dependable electric power for your industry. Today, Ohio's generating capacity is 10.6 million kilowatts, and this state is the number one user of electric power in the nation.

Additional information detailing vital plant site factors is yours for the asking. Send the coupon below on your letterhead for two new booklets of solid facts: Statistical Abstract of Ohio: 1960 and Ohio, The Growth State.

Koder M. Collison, Director
State of Ohio, Department of Industrial and Economic Development
700 Bryden Road Columbus 15, Ohio

Please send: ☐ **Statistical Abstract of Ohio: 1960**
☐ **Ohio, The Growth State** brochure

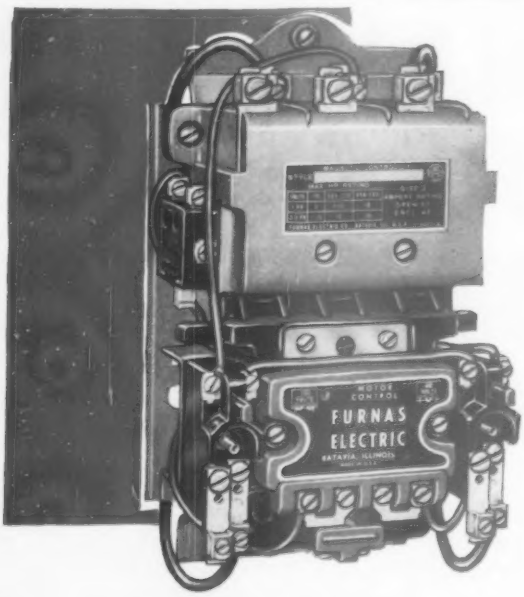
NAME _____ TITLE _____

BUSINESS ADDRESS _____

CITY _____ ZONE _____ STATE _____

For more facts Circle 467 on Reader Service Card

FORWARD with FURNAS FIRSTS



Furnas Firsts

For many years Furnas Electric has pioneered development of outstanding magnetic control features that are now used extensively throughout the motor control industry. Among "Furnas Firsts" are the outstanding features listed below.

TRULY TRIP-FREE THERMAL OVERLOAD RELAYS—melting alloy type. Non-adjustable trip features assure tamper-proof operation.

ENCAPSULATED DUAL VOLTAGE COILS—greater heat dissipation, and greater mechanical strength. 110-220 or 220-440 volts.

IN-BETWEEN SIZES—provide wider selection of controls to match your motor requirements, effecting savings in cost and space.

AUXILIARY SWITCHLETS—offer easy means for adding auxiliary circuits to the starter at any time.

PRESSURE OPERATED MAGNETIC STARTERS—a single unit offering pilot control for pneumatic and hydraulic systems, eliminating unnecessary wiring and piping.

Write today for full information—1032 McKee Street, Batavia, Illinois

A97

FURNAS

FURNAS

ELECTRIC COMPANY · Batavia, Illinois

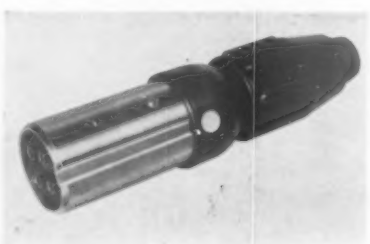
SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

Begins on page 96

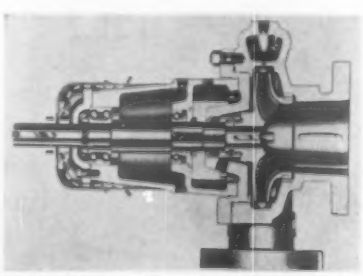
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

137—Plastic pressure pipe withstands pressures up to 100 psi. at temperatures up to 250 F., and is corrosion-proof. Good for either above-ground or underground installation. Available in 10- and 20-ft. lengths, and from ¼- to ⅝-in. wall thickness. *The Ceilcote Co.*



138—Power plug carries 60 amp., and is ultra-safe. Arcing during disconnect is confined to insulated chamber. Special pin insures grounding. Grip attachment locks securely to cable jacket by a neoprene sleeve, eliminating metal-to-cable fittings. *Joy Mfg. Co.*

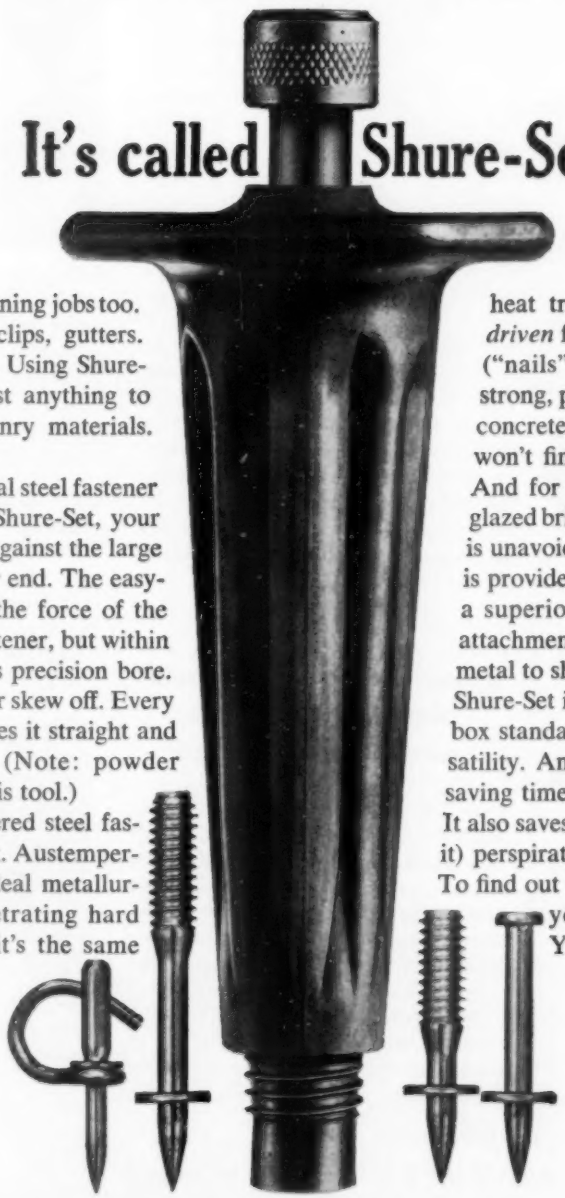


139—Standard process pumps have flexibility of custom-engineered models. Come in two basic types, up to 72 combinations. Model SMJ is good for high temperatures up to 850 F., SMJI for low temperatures to 400 F. Capacities to 1200 gpm. *Byron Jackson Pumps, Inc.*

Turn the page

Here is the tool that permanently anchors a 2 x 4 to concrete with less than ten taps of a hammer. Without drilling or plugging.

It's called Shure-Set.®



It does plenty of other fastening jobs too. Junction boxes, conduit clips, gutters. Heaters, signs, Wiremold. Using Shure-Set you can attach almost anything to concrete and other masonry materials. And you do it rapidly.

How is it possible? A special steel fastener is inserted at one end of Shure-Set, your hammer blow is directed against the large movable anvil at the other end. The easy-to-hit anvil concentrates the force of the hammer blow onto the fastener, but within the confines of Shure-Set's precision bore. The fastener can't waver or skew off. Every swing of the hammer drives it straight and true into the concrete. (Note: powder charges are *not* used in this tool.)

And Shure-Set's austempered steel fasteners *never* bend or break. Austempering has given them the ideal metallurgical properties for penetrating hard construction materials (it's the same heat treatment we give our *powder-driven* fasteners). These steel drive pins ("nails") and threaded studs make a strong, permanent, compressive bond to concrete. For a light-duty fastening, you won't find anything stronger.

And for the few cases—such as tile or glazed brick—where "tap-and-turn" work is unavoidable, a drill holder attachment is provided for converting Shure-Set into a superior masonry drill. Still another attachment fits it for use in fastening sheet metal to sheet metal.

Shure-Set is on its way to becoming a tool box standard because of its immense versatility. And because it pays for itself by saving time. Usually on the very first job. It also saves a lot of (put your own price on it) perspiration.

To find out where to buy Shure-Set nearest you, look under TOOLS in the Yellow Pages of your directory.

288-G Winchester Ave., New Haven 4, Conn. WINCHESTER-WESTERN DIVISION Olin

Specify PANNIER STEEL STAMPS for a longer life of CLEANCUT MARKING

29,335 hammer blows—and still marking cleanly—Pannier Letter and Number Stamps

Rounded corners for finger comfort
Rounded head distributes impact, reduces mushrooming.
Type size Identification
Added metal in Pannier fillet increases durability. Correct bevel gives clearer impression, longer life. Outside bevel longer than inside for protection of character face.

Made of the finest tool steel and correctly heat treated for best combination of hardness and toughness, Pannier single character stamps can take it! Scientific shaping and accurate engraving insure a long life of good, clear impressions. Available in letters, figures and special symbols, and in light, medium or heavy duty design.

Extra tough steel forging stamps for hot or cold, heavy duty marking

For stamping names, part or patent numbers, trade marks and similar markings, Pannier forging stamps are made in four styles:—Hand-style, fullered for wire handle and wood handle style with eye parallel or perpendicular to lettering. All are designed and heat treated for clear impressions and long service. All are covered by the Pannier Master Marker guarantee.

Supreme-Safe Holders with "Roto-Lok" for quick, easy number change

An easy, half-turn flip for Roto-Lok releases any or all of the steel type for fast change. A reverse flip locks them in perfect alignment.

Roto-Lok makes this Pannier Master Marker a time saver in number change and makes serial number marking fast and efficient. The hardened anvil at the base of the type slot keeps type in perfect alignment for equal impression. Machined from bar tool stock, the Supreme-Safe Holder has a heat treated striking head. Both anvil and striking head are replaceable for longer life of the holder itself. Made in hand or wood handle styles, for hot or cold marking.

Write for literature

PANNIER MASTER MARKERS

167 Pannier Building, Pittsburgh 12, Pa.

MASTER PANNIER MARKERS

Begins on page 96

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

140—Closed-circuit TV system for inspection of sewers and water lines comes with an enclosed lighting system, 500 or 1100 ft. of cable, and generator. Goes through pipelines as small as 4 in. and up to 48 in. in diameter. Price: $6500 and up. *Inspectioline Inc.*

141—Zinc plug assembly, for heat exchanger systems with pressures to 200 psig., provides low-cost water protection. Wide range of diameters and lengths with standard steel or brass pipe plugs from ½ to 1 in. Available with weep holes. *Butler Engineering Associates, Inc.*

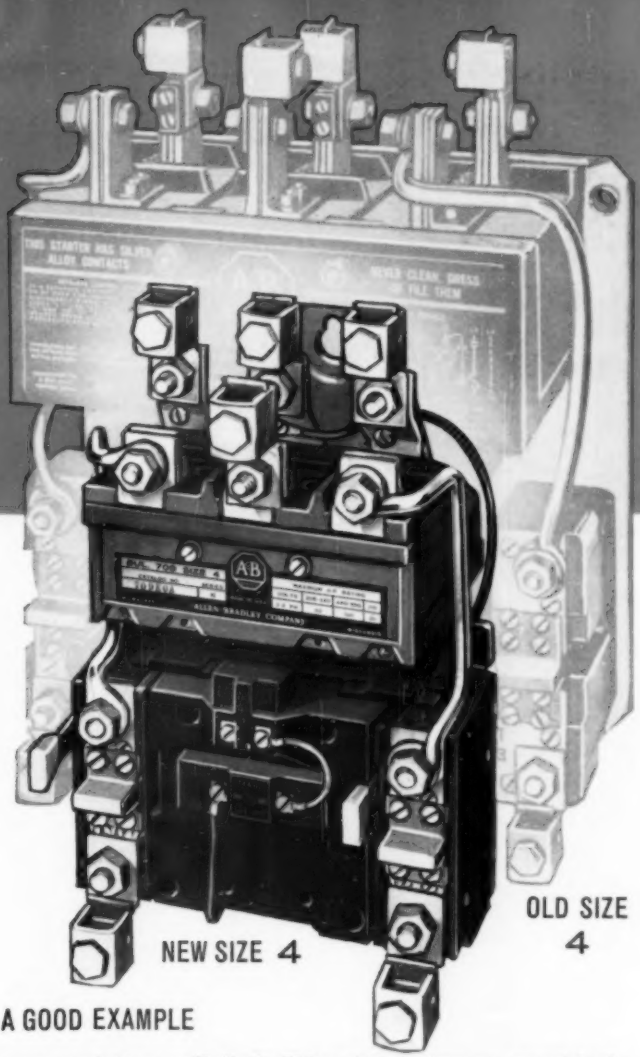
142—Portable magnetic detector finds cracks and flaws in ferrous metals. Weighs 14 lb., works from 6- or 12-volt battery or from rectified 110-volt a-c. Special powder sprinkled over the test area works with probe to reveal cracks. *Westinghouse Electric Corp.*

Turn the page

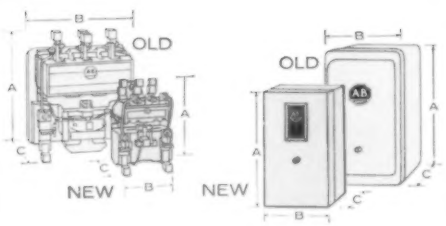
You get BIGGER PERFORMANCE

Plus SMALLER SIZE

with the new
Allen-Bradley
Bulletin 709 Starters



A GOOD EXAMPLE



The new revolutionary Bulletin 709 motor starters are surprisingly small in size—yet, they are good for many more millions of operations—without trouble or maintenance! Rating for rating, they have no equal. They are today's best starter value—and they cost no more!

The "Quality" you've come to expect in all Allen-Bradley control is represented in all details—especially in the "eye appealing" enclosures styled by the world famous industrial designer, Brooks Stevens. Write today for details of the new Bulletin 709 line—the greatest advance in motor control in 30 years: *Allen-Bradley Co., 1316 South Second Street, Milwaukee 4, Wisconsin.*

Check These New SPACE-SAVING Dimensions

Starter Size	OPEN TYPE STARTERS						NEMA 1 ENCLOSURES					
	Height A		Width B		Depth C		Height A		Width B		Depth C	
	NEW	OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW	OLD
00	3⅜	—	3⅞	—	3⁹⁄₁₆	—	7⅝	—	4⅞	—	4¼	—
0	5⅞	5⅝	4¹⁄₁₆	4¾	3¹¹⁄₁₆	3¼	9⅛	7⅞	6⁵⁄₁₆	5⅝	4⅜	4¼
1	6⅝	5⅞	4½	5	3¹¹⁄₁₆	3¼	10	8¹³⁄₁₆	6¹³⁄₁₆	6⅜	4⅜	4¼
2	7⅝	10¹⁄₁₆	4⅝	5¾	3¹¹⁄₁₆	4⁷⁄₃₂	12	14½	7⅝	9	4⅜	5⁷⁄₁₆
3	10¼	12⅝	6¼	7¼	5⁷⁄₁₆	5⁷⁄₁₆	16⅝	19½	10⅜	11⅜	7	6¹¹⁄₁₆
4	11⁷⁄₁₆	16¼	7⁵⁄₁₆	12¾	6¼	6¹³⁄₁₆	22	26⁹⁄₁₆	11⅝	14³⁄₁₆	8	7¹¹⁄₁₆
5	14¹³⁄₁₆	20	9	16⅛	6½	8¾	32³⁄₁₆	41½	17³⁄₁₆	19⁹⁄₁₆	9⅞	13⁹⁄₁₆

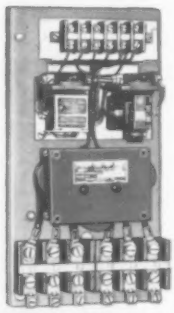
14-61-RM

ALLEN-BRADLEY

Member of NEMA

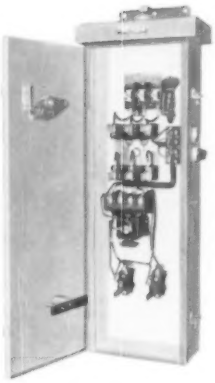
QUALITY MOTOR CONTROL

Your A-B Handy Catalog Lists These Control Devices Often Considered "Special"



BULLETIN 812
Phase Failure—Phase Reversal Relays

Style F relay (above) protects against all open phase conditions on a branch motor circuit. Style R disconnects the motor upon a phase reversal. Style RF gives phase failure and phase reversal protection.

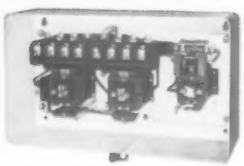


BULLETIN 1232
Pump Control Panels

Complete units for automatic operation of irrigation and oil well pumps. Employ standard A-B Bulletin 709 magnetic starter with manual disconnect switch or circuit breaker in weatherproof enclosure. Wide variety of optional features available.

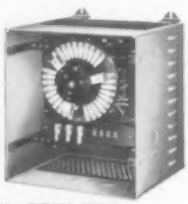
BULLETIN 840
Float Switches

These quality switches are available in a wide range of types for automatic control of motors operating tank or sump pumps. The snap-action switch mechanism assures positive operation, no matter how slowly the liquid level changes.



BULLETIN 1270
Automatic Transfer Switches

These switches are designed to transfer power-load to standby supply when normal power fails or drops too low. Automatically returns load to normal supply when power is resumed. Mechanically interlocked.

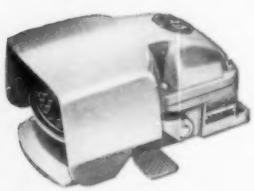


BULLETIN 555
Speed Regulators

Provide manual speed control of wound rotor motors for either fan or machine duty. When used with magnetic starter, the first step closes control circuit.

BULLETIN 365
Multi-Speed Drum Switches

Designed for manual starting, speed changing, and reversing of poly-phase multi-speed motors. Made for up to four speeds either non-reversing or reversing.



BULLETIN 805
Foot Switches

Ruggedly built to withstand the most severe industrial usage. Snap-action switch mechanism features maintenance free silver contacts. The foot switch shown above assures complete "safety" for the operator. Also made without top guard.

BULLETIN 836
Pressure Controls

For machine tool hydraulic systems operating at pressures up to 5000 psi. Oiltight enclosure. Operating pressure and differential are adjustable. A visible indicator shows trip point. Maintenance free silver contacts.

BULLETIN 803
Rotating Cam Limit Switches

Heavy-duty controls for use on automatic production machines. Made with up to 12 independent circuits which can be separately adjusted for operation at any point of rotation.

ALLEN-BRADLEY

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Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

QUALITY MOTOR CONTROL

14-61-RH

Begins on page 96

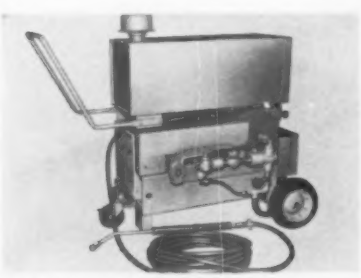
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

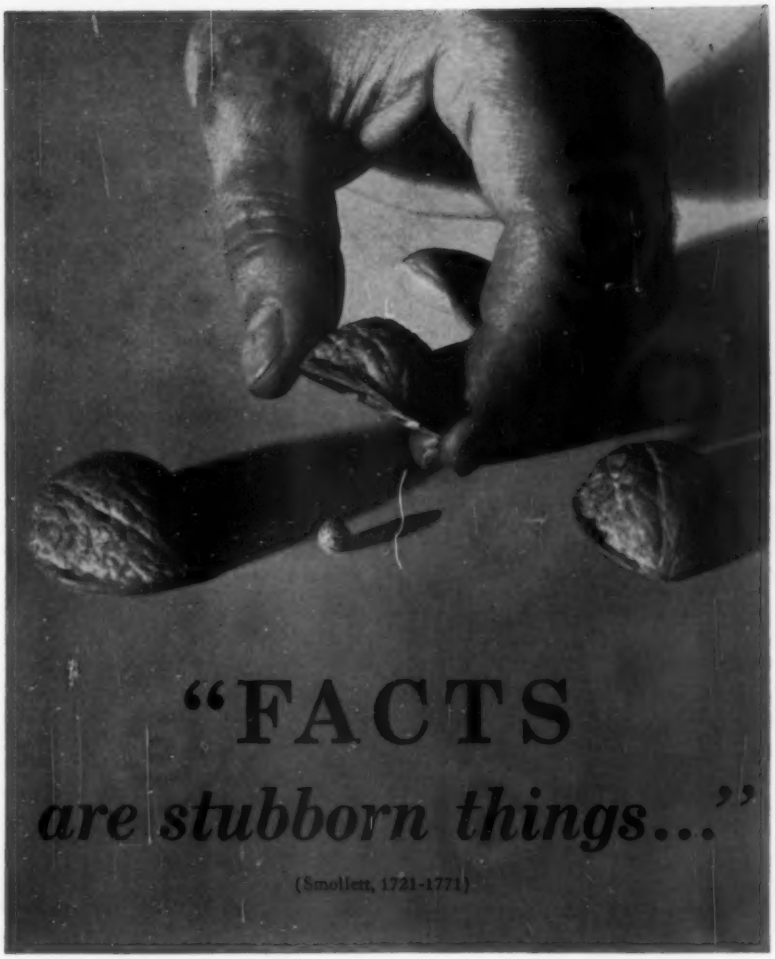
143—Flow gun provides fast, accurate dispensing of any pumpable material. Easy to mount and connect into regular production operations. Automatically cycled, drip-free. Shots are adjustable from 0 to 4 cc. Actuated by 50- to 2500-psi. pressures. *Pyles Industries, Inc.*

144—Heavy-duty solenoid, for machine tools, conveyors, valves, offers improved cycling and pull. Features "T" plunger that produces more level pull curve with no power drop-off as it passes through two-thirds closed stroke. Epoxy-encased coil. *Control Co. of America.*

145—D-C motor and generator, with 190-frame diameter, is compact and responds fast with little vibration. Motor ratings: from 500 hp. at 850 rpm., 240 volts, to 800 hp. at 1150 rpm., 600 volts; generators: 480 kw. at 850 rpm., 250 volts. *Westinghouse Electric Corp.*



146—High-pressure cleaner for engines, parts, and machinery produces a degreasing spray of 25 gal. per hour at 300 lb. pressure. Self-contained, electrically powered, heated. Comes with 40-ft. hose, gun, and three nozzle tips. *Homestead Valve Mfg. Co.*



Why play guessing games when it comes to plant security?

In safeguarding life, property and profits against fire, burglary and other hazards, ADT automatic protection services have *proved* their effectiveness and dependability.

Here's the evidence in a nutshell:

It's a fact — during the past ten years, ADT waterflow alarm service provided subscribers with an immunity against fire loss that averaged 99.98 per cent of protected values.

It's a fact — throughout the same period, subscribers to ADT burglar alarm service enjoyed an immunity against burglary loss that averaged 99.99 per cent.

Dependability like this warrants serious consideration. Other facts about plant protection are contained in an illustrated booklet that's available (Canada and U. S. only) by writing to us. Better still, call the ADT security specialist listed in your telephone directory.

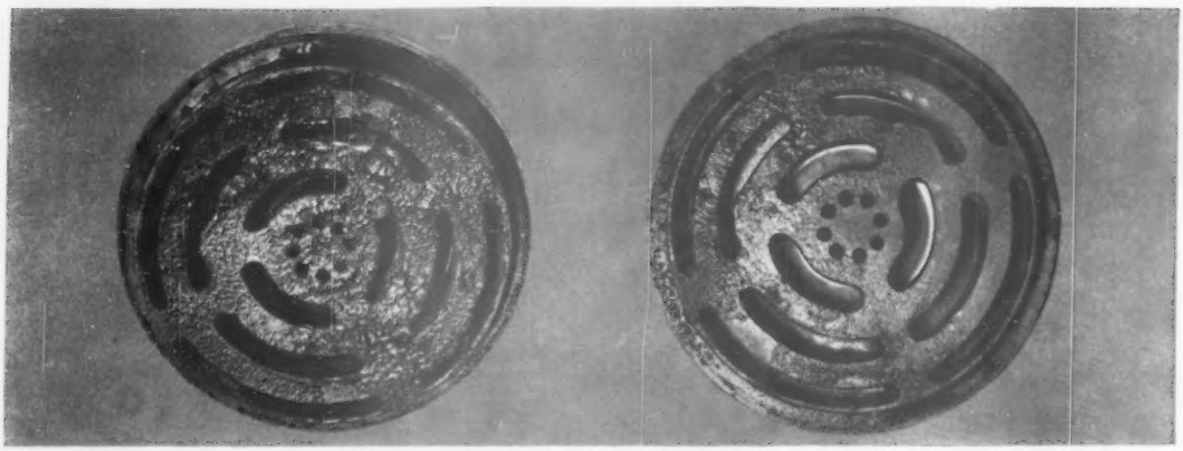
AMERICAN DISTRICT TELEGRAPH COMPANY

Executive Office: 155 Sixth Avenue, New York 13, N. Y.

A NATIONWIDE ORGANIZATION

ADT

For more facts Circle 472 on Reader Service Card



Carbon building up in your compressors? Here's why one of the many Sun Solnus oils can be your answer. The valve on the left is from a three-stage Norwalk horizontal-type compressor after 3,000 hours operation with a well-known high grade oil. At the right is the same valve after a 3,000 hour run with a Sun Solnus oil. Note the difference in carbon deposits! *Solnus oils form very little carbon . . . and what does form is so soft it can be blown away!*

somewhere in your plant . . .

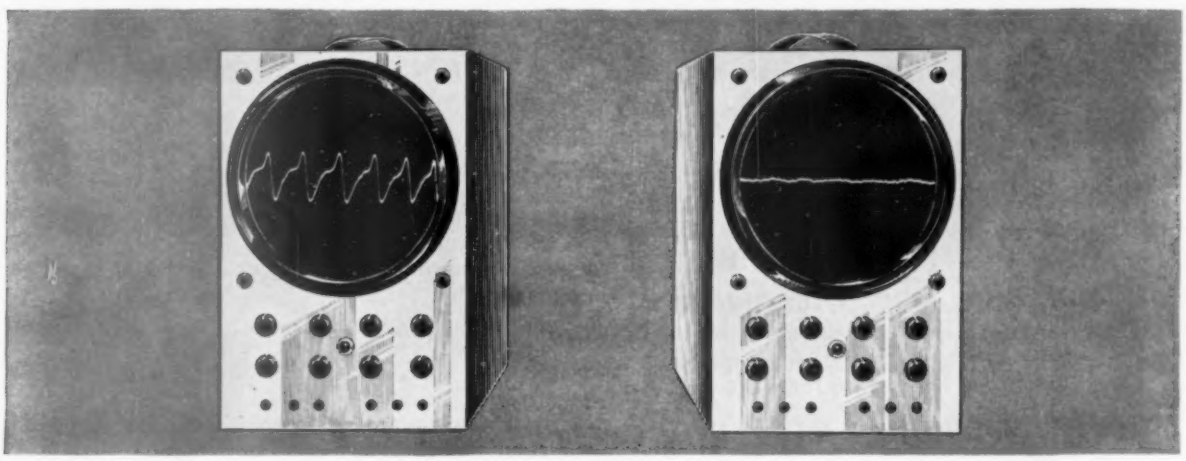
A SUNOCO PRODUCT CAN STOP TROUBLE, CUT COST!

SUNOCO
Quality . . .
THE BEST ECONOMY OF ALL

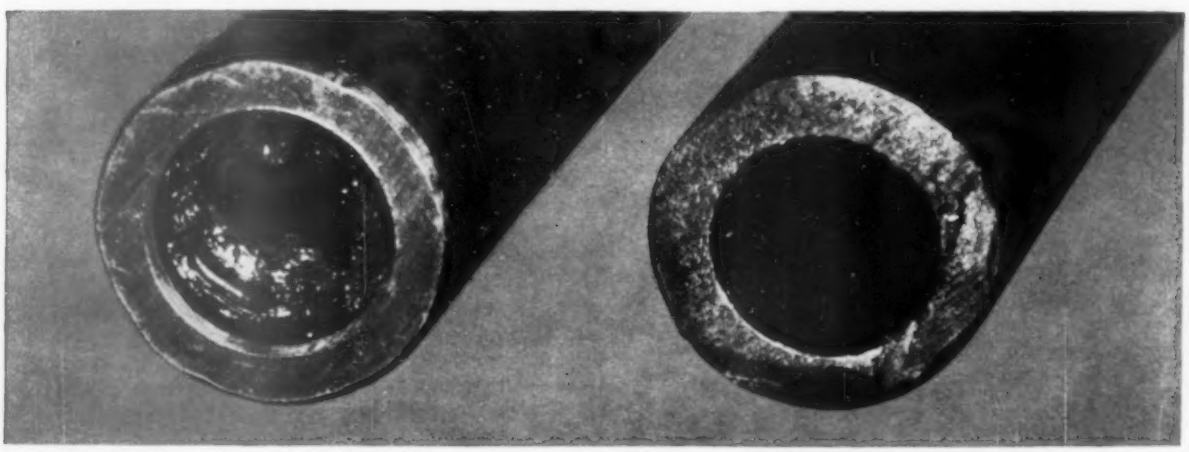
The reason is as simple as this. There are over 400 Sunoco petroleum products for industry. *Each* has the properties needed to do its job right. *Each* is job-fitted by men who know what they are doing. And *each* is backed by the service you have a right to expect. The examples on this page will give you an idea of what we mean by Sunoco quality . . . and how quickly that quality can pay off in your applications. Call your Sunoco representative today for a hand on any problem with any petroleum product you are using. Or write to:

SUN OIL COMPANY, PHILADELPHIA 3, PA., DEPT. F-7
In Canada: Sun Oil Company Limited, Toronto and Montreal

Hydraulic oils chewing up your O-rings, packings? The O-ring on the left was soaked in a Sun Solnus oil for 70 hours at 300F and is still as pliable as when new. The O-ring at the right was soaked in another hydraulic oil for equal time. It snapped like a match stick when flexed, for many hydraulic oils extract plasticizers from seals turning them brittle, creating leakage, replacement problems. Besides keeping rings flexible, Solnus oil restores pliability to unbroken rings already in service.



Slip-stick table motion ruining fine work pieces? These are magnified oscillogram patterns of slip-stick table motion. The jagged pattern on the left resulted when regular way oil was used on the ways; the straight line on the right, when Sunoco Way Lubricant was used under identical operating conditions. Here is graphic evidence of how effectively you can stop slip-stick table motion, protect the ways, get better surface finishes, and cut production losses with job-fitted Sunoco Way Lubricant.



Hydraulic lines gunked up? The fouled up line at the left was cleaned out in no time when a Sunvis 700 hydraulic oil was used in the system! These oils are especially made to keep contaminants in suspension, flush them away to the filters while transmitting power. They are so effective that a single charge of a Sunvis 700 oil can keep even a continuously contaminated system running smoothly for months, often *years*. Check your Sunoco representative for a job-fitted Sunvis oil for your systems.

COVER STORY

PLANNED REPAIR JOBS HOLD DOWN COSTS

More and more, emergency downtime is becoming a cost cancer. Planned and scheduled repair jobs can cut losses. But it takes a lot of doing to work out the best schedules. Here's a case where maintenance and production joined hands for best results.

By **A. M. ROBINSON**, Central Planner
Maintenance Planning Section, Union Carbide Company
Texas City, Tex.

Ours is a heavy-chemical multi-process plant. Union Carbide Chemicals makes over 60 products in its 318-acre Texas City factory. Sometimes more than one product is made in the same equipment. Demand varies for each product. In some units products are made by a different process than in others. Also, most units depend on sister units for raw materials—there is little in-process inventory. Now you can understand the problem of planning and scheduling maintenance: How to get the most output and also shut down equipment for needed repair or overhaul.

Obviously, our operating and maintenance functions have to team up for best results. But when so many people are involved in decision making, a good communications system to gather facts and spread decisions is also necessary. Thus, the planning and scheduling of maintenance at UCC is handled by a central organization—the maintenance planning section. Its function is purely staff, comprising 3 men for 1000 maintenance personnel. The final decision as to what maintenance work, when, and how long a shutdown is always a joint decision of the maintenance and operating departments.

Some three years ago we developed a formalized planning and scheduling program with the following six objectives:

1. To obtain optimum maintenance at least cost. This means lowest maintenance cost per pound of product. Yet all equipment is not maintained to the same degree because its programed useful life varies. Optimum maintenance calls for highest utilization of major maintenance equipment. For example, our mobile cranes and compressors now run near 97%. Optimum maintenance also requires that 8 hours of work per man be planned and scheduled every day.

2. To reduce downtime and breakdown time. We have planned, studied, and replanned repetitive shutdowns, revised methods and schedules. Detailed planning has often cut downtime by 15% to 20%. In some cases, length of shutdown has dropped from 10 to 3 shifts. Better planning of jobs has attacked and solved causes of breakdowns involving improper design or materials, and overuse or misuse of equipment.

3. To reduce maintenance overtime. It's not easy to decide how much overtime is justified. It's important for us to adhere to scheduled start-ups, to avoid delivery complications. Despite an expanding plant and stable maintenance work force, overtime has been held at a 3-year average of 3.3%.

4. To lower material and tool expenditures. Total tool cost for the last 2 years of growth is unchanged.

5. To cut the maintenance portion of total manufacturing cost. Labor costs are a big factor. Our worker activity levels are 100% better than the maintenance shutdown average before major job planning. They indicate direct manpower savings of over $230,000 for 3 years. Fewer non-essential jobs are being done.

6. To improve operating efficiency by reducing conflicting shutdowns and their effect on output. Major maintenance scheduling has resulted in closer coordination between related shutdowns, with less production loss. Overhaul of steam and utility units are now coordinated with operational shutdowns. Better scheduling —both long-range and immediate—is guiding operating departments in purchases of raw materials.

Maintenance job planning is a way of life at UCC. In one way or another all maintenance work—big or small jobs—is planned and scheduled. To us, planning generally involves how to do the job, and scheduling means when to do it. The number of jobs runs daily into the thousands. This article deals only with major work, where the problem is greatest. Jobs in any one or more of these categories are considered major work:

- Multicraft, over 100 man-hours.
- Requires shutdown or production cutback.
- Complex jobs combining many small jobs.
- Requires special tools, skills, and operations.
- Requires more than one shift.
- Requires coordination among engineering staff, shops, construction, and rotating shifts.

The common denominator of all these types is the need for coordination. A 75-hour job spread over 3 shifts needs it. A bad steam leak on a unit, in itself only a 2-hour job, can allow other jobs to be sandwiched in during the shutdown. Replacing the stem of a 30-in. underground valve without halting service may need line-tapping equipment on a rental basis. The maintenance foreman is too busy on his own planning and scheduling of local small jobs to give such major jobs proper detailed attention. Although one may come up in his area about once every 2 weeks and last only 2 or 3 days, it's critical because it can tie up a whole production unit. While major jobs total only 10% of all maintenance man-hours, their effect on the plant economy justifies coordination by a staff planner.

Planning and scheduling of major jobs at UCC falls into three sequences or steps. First it is necessary to draw up a long-range schedule among the many major jobs. This involves the broad and continuing problem of priorities. Next follows the detailed planning of each major job. Then comes the scheduling of single imminent jobs, for the current week and the next week. We need to discuss each separately.

PRIORITY SCHEDULING

It's based largely on a formal request made semi-annually to each of 36 operating department heads by the central planning organization (CP). Each one is asked about 30 days ahead to submit his forecast of major maintenance needs for the next 6 months to his respective area operating superintendent. These needs include straight maintenance, revision, or expansion, or any combination of these.

Our plant is divided into four main operating areas, each one headed by an area operating superintendent over a group of department heads. The maintenance organization parallels this set-up with a maintenance superintendent at the top, plus two assistant maintenance superintendents who are in control of a group of area maintenance supervisors, one for each production area. Maintenance manpower is both decentralized (assigned to each of the four areas) and centralized (assigned to specific pools for plantwide work and loan to the areas). Each area maintenance supervisor directs a group of assistant foremen. They, in turn, supervise the leadmen and craftsmen.

To insure complete and uniform information, each forecast is made on a simple letter-size form. It asks for single-line data on each job as to (1) estimated date, (2) building number, (3) shutdown duration, (4) job description and pertinent remarks. A sample entry would read (1) April 4, (2) Bldg. 18, (3) 16 hours, and (4) Reline cylinder No. 1 compressor. Enough lead time is allowed for department heads to discuss their requirements with area maintenance supervisors. The findings are sent to their area operating superintendents for approval and monitoring. Each area superintendent must approve all revisions to equipment, also make sure there are no shutdown conflicts. Two department heads might want a shutdown the same week, which would not be economical. Or some long-range production requirements might conflict with proposed shutdowns. At this point the superintendent consults with production planning, works engineering, and the assistant maintenance superintendent to insure forecast feasibility. The approved forecasts then go to CP.

It's obviously impossible to produce a complete forecast at this stage. Unexpected major repair jobs will pop up all along. They are handled by formal requests as they arise, and are worked into the schedule.

Three schedule boards. When CP receives the job forecasts or interim requests, it posts each job, by date wanted, on one of three schedule boards:

. . . *Daily schedule.* This shows jobs for current week and next week. Wall-mounted, about 6x6½ feet, this board has four horizontal sections for the four major operating areas. Jobs are marked as to description and location in erasable grease pencil on magnet-backed plastic strips, 1x17 inches, which are re-usable. Jobs for the current week are placed at extreme left of schedule board, those for the next week in a column at right. Remainder of the board (about 3 feet) is divided into five vertical daily sections, for Monday through Friday. Each daily section is further vertically subdivided to show major crafts—pipefitters, riggers, mechanics, and so on. Magnets adhere to ¾-in. metal strips fixed on the board along each vertical dividing line.

. . . *Weekly schedule.* This shows jobs for six weeks, from third week through eighth. Same construction as daily schedule, except that each week is on a separate panel so that it can be easily moved ahead of each passing week. Uses same kind of plastic strips.

. . . *Long-range schedule.* This is a standard 30x50-in. Acme board (Gantt type) that uses plastic tabs with paper inserts to identify each job. Tabs are scaled according to estimated length of job. This board takes care of 25 weeks—from ninth week through thirty-second. It is also divided horizontally to show four major areas. Top part of board (about two-thirds) contains first 12 weeks, bottom part second 12 weeks. As dates advance, more space is needed for more jobs.

Flexibility in shifting jobs is the keynote of all three boards. The movable plastic strips and tabs allow for schedule changes at any point of time.

Scheduling procedure. Each Friday a letter-size "Weekly Maintenance Master Schedule" (page 134) is distributed to all operating, maintenance, and staff people. It shows all major jobs scheduled for the next 6 weeks. A typist prepares it as a multilith form from the daily and weekly schedule boards.

Turn the page

TWO KEY FORMS THAT SMOOTH

DATE 3/30/61 **WEEKLY MAINTENANCE MASTER SCHEDULE**

	W/B 4/3	W/B 4/10	W/B 4/17	W/B 4/24	W/B 5/1	W/B 5/8
UTILITIES	Overhaul #2 boiler, Bldg. 11 Clean treated water pump, Bldg. 9	Overhaul #6 generator, Bldg. 11 Overhaul #2 cycle water pump, #1 pump house	Overhaul heat exchanger, Bldg. 11 Repair boiler fan, Bldg. 75	Repair #1 turbine, Bldg. 11 Overhaul sump pump, #1 pump house	Overhaul #3 generator, Bldg. 11 Repair cooling-tower pumps, Bldg. 107	Overhaul #4 boiler, Bldg. 11 Revise treated water pipe, Bldg. 9
GAS	Clean #13 tank, Bldg. 102 Overhaul & regrout #11 compressor, Bldg. 72 Clean scrubber, Bldg. 143 Install 2 new pumps, Bldg. 208 Fabricate & install new cooler, Bldg. 7	Overhaul heater, Bldg. 57 Clean and test condenser, Bldg. 72 Overhaul #10 compressor, Bldg. 72 Furnace repairs, Bldg. 68 Revise pipe on refining column, Bldg. 8	Overhaul #9 compressor, Bldg. 36 Tie in column, Bldg. 97 Clean condenser, Bldg. 57 Revise process line, Bldg. 53 Rebuild heat exchanger, Bldg. 33	Repair & revise cooler, Bldg. 101 Repair trays in column, Bldg. 106 Clean #14 tank, Bldg. 105 Revise pipe, Bldg. 105	Overhaul #3 compressor, Bldg. 72 Repair stack, Bldg. 105 Revise water pipe, Bldg. 36 New process air line, Bldg. 136 Furnace repairs, Bldg. 105	Change out calandria, Bldg. 8 Overhaul #5 compressor, Bldg. 72 Repack scrubber, Bldg. 138 Revise crude column pipe, Bldg. 161
CHEMICAL	Install 2 storage tanks Bldg. 79 Prepare for column overhaul, Bldg. 51 Dismantle, clean, and test columns, Bldg. 16 Install filter, Bldg. 21 Prepare for converter catalyst change, Bldg. 44	Clean scrubber, Bldg. 88 Overhaul column, Bldg. 51 Repair system, Bldg. 51 Converter catalyst change, Bldg. 44	Assemble column, Bldg. 16 Overhaul batch still, Bldg. 51 Revise pipe on still, Bldg. 54	Install new tank, Bldg. 79 Tie in experimental unit, Bldg. 84 Replace sections in column, Bldg. 14 Clean process pipe, Bldg. 34	Clean column, Bldg. 53 Revise #2 column pipe, Bldg. 81 Install new preheater, Bldg. 19 Change out coils in tanks, Bldg. 61 Repair leak in tank #14, Bldg. 22	Install new separator, Bldg. 51 Revise trays in #1 column, Bldg. 81 Install new pipeline at dock
VINYL	Install separator, Bldg. 121 Overhaul system, Bldg. 123 Overhaul compressor, Bldg. 117	Clean batch still, Bldg. 108 Overhaul blower, Bldg. 110	Overhaul system, Bldg. 123 Revise system pipe, Bldg. 118	Overhaul system, Bldg. 126 Install new product pump, Bldg. 131	Overhaul system, Bldg. 132 Overhaul batch still, Bldg. 147	Revise system pipe, Bldg. 135 Overhaul system, Bldg. 121

WEEKLY SCHEDULE. Every week this schedule is sent to all operating, maintenance, and staff people. It shows all major maintenance jobs scheduled for the next six weeks, gives a basis for priority scheduling at planning meetings.

. . . PLANNED REPAIR JOBS

Copies go to all assistant plant managers, area operating superintendents and department heads, works engineering, maintenance superintendent and assistants, area maintenance supervisors, assistant maintenance foremen and shop foremen, planners, production planning, safety department, rotating maintenance shift foremen. Theres no communications gap.

This master schedule is the result of a Thursday meeting in CP. More on that later. Before the next meeting each operating department head uses the schedule as a work sheet, either to confirm or seek to change it, or to add or remove jobs. He requests unlisted new jobs either orally or in writing from his area operating superintendent. He, in turn, discusses jobs and priorities with the area maintenance supervisor.

Attendance at the regular Thursday meeting is usually 10 to 15 people. We try to hold it to as few as possible, yet enough to communicate necessary information. Only one area operating superintendent represents an area. He is rotated every 3 months. He must be familiar with all major work in his area. If he comes unprepared, the manpower for major work in his area may be shifted elsewhere the next week.

Others attending: a representative for production planning and men for special-interest groups, such as the machinery craft foremen and electrical department;

SCHEDULING OF BIG JOBS

WORKBLOCK DESCRIPTION

JOB TITLE: No. 1 Distillation Column Shutdown **W. B. NO. 6**

W. B. TITLE: Overhaul 3 Column Pumps **CHARGE** 830-1111

DESCRIPTION OF WORK	SEQ. NO.	CRAFT	NO. OF MEN	TOTAL MAN-HRS.	TOOLS	MATERIALS	QUANTITY	SPECIAL REMARKS
Scaffold piping	Prel	C	2	2	1 set of chain falls			3" & 4" pipe
Remove pipe from 3 column pumps for overhaul	A	PF	2	8	One ½" air impact wrench			
Tear down 3 column pumps completely	B	M	2	24				
Install new mechanical seal on No. 1 pump	C	M	2	32		As supplied by machine shop	1	See J. Jones for shop work on seal prior to shutdown
No. 2 & No. 3 will probably require impeller replacement; then reassemble pumps						Byron-Jackson 6" impeller	2	
Replace pipe on 3 column pumps	D	PF	2	8	As listed	4" gaskets 3" gaskets	6 12	Precut standard

WORKBLOCK DESCRIPTION. Each major job is broken down by a planner into workblocks that contain no element over 32 man-hours in any one craft. This results in the fairly accurate time estimates essential to a job scheduling system.

each assistant maintenance superintendent and area maintenance supervisor; and the head planner.

This meeting takes about 30 minutes. Guided by the schedule boards, it systematically reviews every job in every area, and makes adjustments for carryovers, changes, and additions. If a manpower conflict between large jobs is spotted when first posted, it is discussed and resolved. If critical levels of craft loads are reached, they are pointed out and solved by moving jobs. In substance, the production and maintenance functions come to agreement on work priorities.

Following this agreement, in the next 30 minutes the area maintenance supervisors check requirements for maintenance manpower, heavy equipment, supervision, and other special needs for the next week. This may call for redistribution of manpower and facilities from one area to another. One important aim is to level the manpower peaks and valleys for better utilization. Our meeting tries to get an efficient balance.

Daily board. To date, our daily board is not fully developed. As yet, the craft manpower breakdowns are not posted. Thus, manpower distribution among the four areas for each day is done by a "seat of the pants" method. To obtain reliable breakdowns we must know how long each segment of each job takes.

Turn the page

We are now making a systematic time-study approach. Ultimately, the data on required man-hours will come from planned job-crew controls or, in the case of repetitive jobs, from a file of job standards. Then, if the total daily needs of each craft in any area don't match what's available, we will resort to intelligent manpower redistribution, use of shift people, use of overtime, or even transfer of a job to another time.

PLANNING EACH JOB

Detailed job planning is not attempted by CP until the job reaches the weekly schedule board—at most 8 weeks ahead. CP asks operations for detailed lists of work, charges, and special requirements. It needs rough lists at least 2 weeks before start of a shutdown. If a shutdown demands considerable preliminary work, lists are required earlier. Each planner handles about 2500 man-hours of work per month.

Workblock technique. To achieve reasonable accuracy in specifying what needs to be done, how to do it, and how long it will take, we use a workblock technique. We break a major job into small segments called workblocks (see sample, page 135). Each workblock is analyzed on a letter-size form that contains work descriptions of repairs or alterations to be done. Each sheet lists sequential step-by-step procedures showing craft, number of men, estimated man-hours, materials, tools, and special instructions for each step. Special operating restrictions are also noted.

We purposely restrict each workblock procedure to not over 32 man-hours for any one craft. This 32-hour limit gives close labor-time estimates. A UCC survey and statistical analysis have shown that 95% of these estimates hit the actual time of the job.

Procedures that are large and seem to defy a breakdown get special attention. We make every possible move to break them into smaller procedures. The planner gathers his information from many sources—engineering, operations, maintenance, shops, and experienced people. He must keep it current, as the situation changes constantly. Such information includes:

- When and how the equipment is to be shut down.
- What safety precautions are needed.
- What modifications are wanted in equipment.
- In what various ways workblocks can be done.
- What methods can be used.
- What shop work is involved.
- What special tools or materials are needed.

Close estimates. Despite formidable variables, a survey of 286 UCC man-hour estimates showed that with a tolerance of ±5%, 34% have been greater than actual, 24% exact, and 42% less than actual. The average of estimated to actual was 85%, excluding workblocks added after estimates. It's now running at 93%. Added work is caused either by failure to include it in final work description, or by an unexpected repair (such as a valve that leaks when it has been closed). The better our information, the better our estimates, and the more accurate and complete our schedules.

Man-hour estimates are procured several ways. They may be based on estimates from the leadmen, assistant area foreman, and craft foreman who will supervise the job. Or on historical data from previous jobs. Workblocks promote logical and detailed analyses, and sheets are filed with actual times on repetitive jobs. On such jobs, planners use sampling time-study techniques to determine average times for each portion. The planner always monitors and cross-checks his estimate to assure best possible accuracy and detail. The ultimate UCC goal is a complete library of maintenance time standards—these are necessary to achieve control.

Critical workblocks. A shutdown job may contain from a few to 300 or more workblocks. Some workblocks are critical in that they control the length of the shutdown. If you shorten such a workblock through a better method, more manpower, or special tools, another workblock may take its place (Editor's Note: See "Critical Path Scheduling," FACTORY, July 1960). You never eliminate all critical workblocks. You cut out as many as manpower, equipment, and space will allow. At any one time the total duration of the job will be controlled by the remaining workblocks.

Planning the character of each workblock must be integrated with the over-all job. As you increase their number—especially if they need identical crafts simultaneously—you tend to decrease worker productivity. This simultaneous demand may limit work for other crafts for short time periods. To eliminate conflicting workblocks, priorities and scheduling must be correctly determined in the planning stage.

The number of men who can work on a piece of equipment at one time must also be determined. Overcrowding can diminish productivity, lengthen job time. A planner should go to the job site, think the job through, visualize effects of crew size. Liaison with shops, contractors, and works engineering is invaluable. So is experimentation with pilot models. Once he determines his best method, the planner specifies tools, equipment, and materials on the workblock sheets.

JOB SCHEDULING

One of the greatest cost reductions achieved by our detailed planning is realized from our job scheduling. It coordinates all the workblocks of a single job for optimum performance. The planner must foresee and either provide for or eliminate conflicts caused by craft restrictions, material revision working time, process equipment purge and entry restrictions, operating production needs, sequential maintenance procedures, manpower and shop availability, heavy and special equipment requirements, working space, and flexibility for other work. In so doing, he must schedule an estimated 8 hours of work for each craftsman for each shift. He must also bear in mind that it is uneconomical to change the total number of men on a job often, because of the cost of shifting to other work areas. Efficient scheduling can be a tedious and hard task.

Turn the page

LINK-BELT Universal Worm Gear Speed Reducers

3-way mounting flexibility

VERSATILE UNIVERSALS DELIVER MORE HP PER POUND, PER DOLLAR

Three-way mounting flexibility gives Link-Belt *Universals* an almost limitless application range. With simple changes of oil-gauge and breather, they can be mounted with worm shaft below gear . . . with output shaft vertical . . . or with worm shaft on top of gear.

Because of simple, compact design, *Universals* give you maximum hp in a small housing . . . *more hp per pound, per dollar!* Initial cost is low, minimum mounting space required.

Other design features include: automatic splash lubrication, durable centrifugally cast bronze-alloy gears, hardened, ground and polished nickel-steel worms and adequate roller bearings. Single and double lip oil seals ride on micro-finished shafts. High capacity involute helicoid worm threads assure accurate engagement.

Universals are made with 2½", 3", 3½" and 4" shaft centers. Completely assembled units—with ratios 10, 15, 20, 25 and 50:1—may be obtained off-the-shelf from nation-wide stocks.

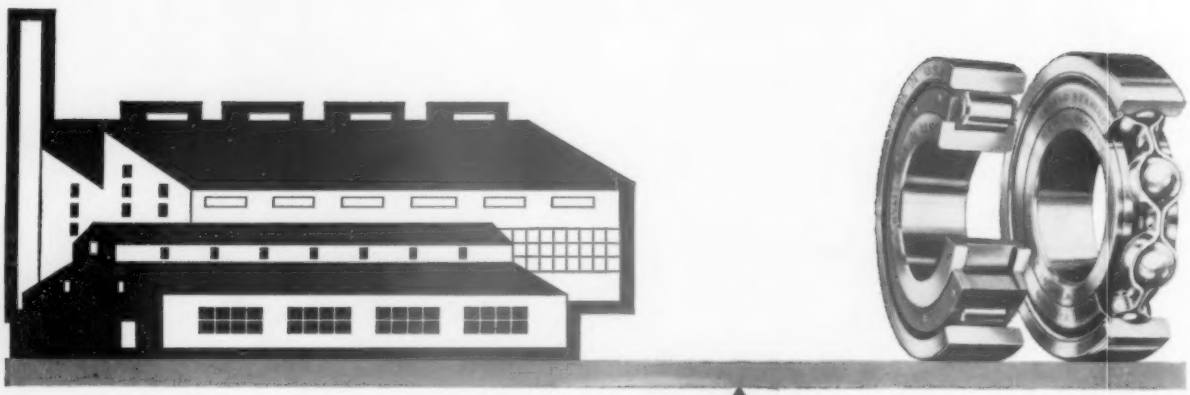
SEE THE YELLOW PAGES

for your nearest Link-Belt office or authorized stock-carrying distributor. Look under "Speed Reducers." For full details on *Universals* ask for Book 2824. And ask, too, about the many other speed reducers in *industry's most comprehensive line!*

LINK-BELT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 15,503

YOUR BUSINESS IS IN THE BALANCE . . . and bearing failures can work against you. That's why it's important to specify New Departure ball bearings and Hyatt roller bearings for the machinery in your plant. They provide significant performance reliability, the kind of worry-free, trouble-free service that helps to cut costs and keep maintenance to a minimum. Together N/D and Hyatt are the world's largest manufacturer of bearings. With nearly 30,000 original equipment customers, they supply bearings for virtually every type of industrial equipment in use today. These high quality, durable bearings are readily available to you through the national network of N/D-Hyatt Industrial Bearings Distributors . . . who are backed up by United Motors Service bearings warehouses across the country. So when you replace bearings, be sure you get the best fast. Specify these reliable high-performance bearings from your Authorized New Departure and Hyatt Industrial Bearings Distributor.



GM U-M-S PARTS SALES
UNITED MOTORS SYSTEM

New Departure and Hyatt bearings are supplied through
U-M-S Authorized Industrial Bearings Distributors

HYATT NEW DEPARTURE

For more facts Circle 475 on Reader Service Card

How it's done. Each procedure of a job's workblocks is scheduled either by a Gantt chart (on paper) for small major jobs or by a schedule board (again an Acme Gantt-type) for large jobs. A typical board lists workblock titles and reference numbers on left side in horizontal rows. Various colored tabs for different crafts are spotted to the right under the dates scheduled. Length of tab indicates calendar man-hours. Grease-pencil numerals on tabs show number of men.

Copies of the board for field control are obtained by photostating. Colors come out in shades of black to white. Sometimes the board is taken to the job, and tabs are pulled off as work is completed.

Flexibility. This is the ability to move workblocks to other places in the schedule without impairing it. Flexibility is needed to take care of (1) low estimates, (2) added workblocks, and (3) inclement weather. It can be achieved by sprinkling non-critical work, which can be safely shifted, among critical work. Critical workblocks always get top priority. Some workblocks must be done within certain time areas or they, too, will become critical or increase total job time. Other workblocks contain parts where the work can be done before actual shutdown. Construction of a pre-fabricated part is one example. Such work can be spread over a long period, permitting uniform manpower distribution and requiring fewer men during shutdown. More manpower and overtime are other possible solutions for a lagging project.

Crew control sheet. After a job schedule is prepared and reviewed with operating and maintenance supervision, CP fills in a crew control form. Its purpose is to insure the correct number of craft personnel on the job, also of truck-drivers, equipment operators, engineering help, and staff. This sheet shows concise manpower requirements for each craft for each shift for each day the job is scheduled. CP brings crew control sheets for each planned job to the Thursday planning meeting. They are checked during decisions on manpower distribution.

Turn the page

RUGGED REVOLVATOR LIFTS
are adapted to your needs

Since 1904 Revolvator has been building portable elevators and related lifting equipment. Portable elevators are available in any reasonable lift and platform size in capacities from 500 lbs. to 5,000 lbs. Lifting may be by cable or hydraulic, hand operated or electric, according to requirements. Variations of fixed or revolving base, telescopic masts and other accessories are available.

Portable cranes, barrel and carboy handling and dumping lifts and similar types of equipment are based on the same rugged Revolvator components and design as the basic portable elevator.

INDEX No. 11.17
Revolvator portable elevator. Electric powered telescopic mast type shown. Revolving bases and other features available.

INDEX No. 11.21
Uplifter with two speed hand hoist and dual capacity. Stock unit available in standard sizes.

INDEX No. 11.22
Uplifter with electric hydraulic hoist with two roller chains. Stock models available in two sizes and capacities.

INDEX No. 13.22
Revolvator manually moved, electric hydraulic hoist fork lift. Designed for later conversion to fully powered Go-Getter.

INDEX No. 11.31
Revolvator semi-portable hydraulic lift table. For sheet feeding, etc. Where conditions do not permit submerged pistons as with Index 12.21 models.

INDEX No. 31.10
Revolvator barrel dumper with either hand or electric hoist. Either front or side dumping models discharging at any reasonable level to suit requirements.

REVOLVATOR CO.
ESTABLISHED 1904

Designers and Manufacturers of Portable Elevators, Power and Hand Lift Trucks, Hydraulic and Traction Elevators, Carboy and Barrel Dumpers, Portable Cranes, Positioners, Storage Racks, Turntables and Other Material Handling Equipment.

8761 TONNELE AVENUE
NORTH BERGEN, NEW JERSEY

Sales Representatives in Leading Centers

For more facts Circle 476 on Reader Service Card

THE BRIDGE TO *Progress* AND *Safety*...

The bridge in this picture, designed to carry both horse power and man power across the Root River, represents a step to further expansion of Western Printing and Lithographing Company facilities in Racine, Wis.

Western selected Globe's Safety GRIP-STRUT grating on this bridge for greater safety and for greater economy. Safety GRIP-STRUT is the new basic material, all in one piece (including channels), not welded, riveted or expanded, in steel or aluminum, in standard sizes and gauges. It presents an open space, in a diamond pattern, in excess of 55% of the area for a positive NON-SKID footing in all directions. It is also ideal for work platforms, stair and ladder steps, flooring, balconies, catwalks, machinery guards, fire escapes and for original equipment safety treads.

IMPORTANT SAFETY FEATURES:

Fire proof, slip proof, maximum strength, minimum weight, easy to stand and walk on, cool in summer, warm in winter.

BIG ECONOMY FEATURES:

For balconies—no extra light needed below—no extra heat. No extra supports needed—Channels are integral part of the material. No secondary sprinkler heads necessary. Self cleaning. Cut and installed like lumber by your own maintenance force. Low in original cost.

Write for new complete catalog. Distributors in all principal cities. Consult yellow pages in phone book under "GRATING".

GRIP-STRUT PATENTED

PRODUCTS DIVISION

THE GLOBE COMPANY

1014 S. PRINCETON AVENUE
CHICAGO 9, ILLINOIS

PLANNED REPAIR JOBS

Begins on page 132

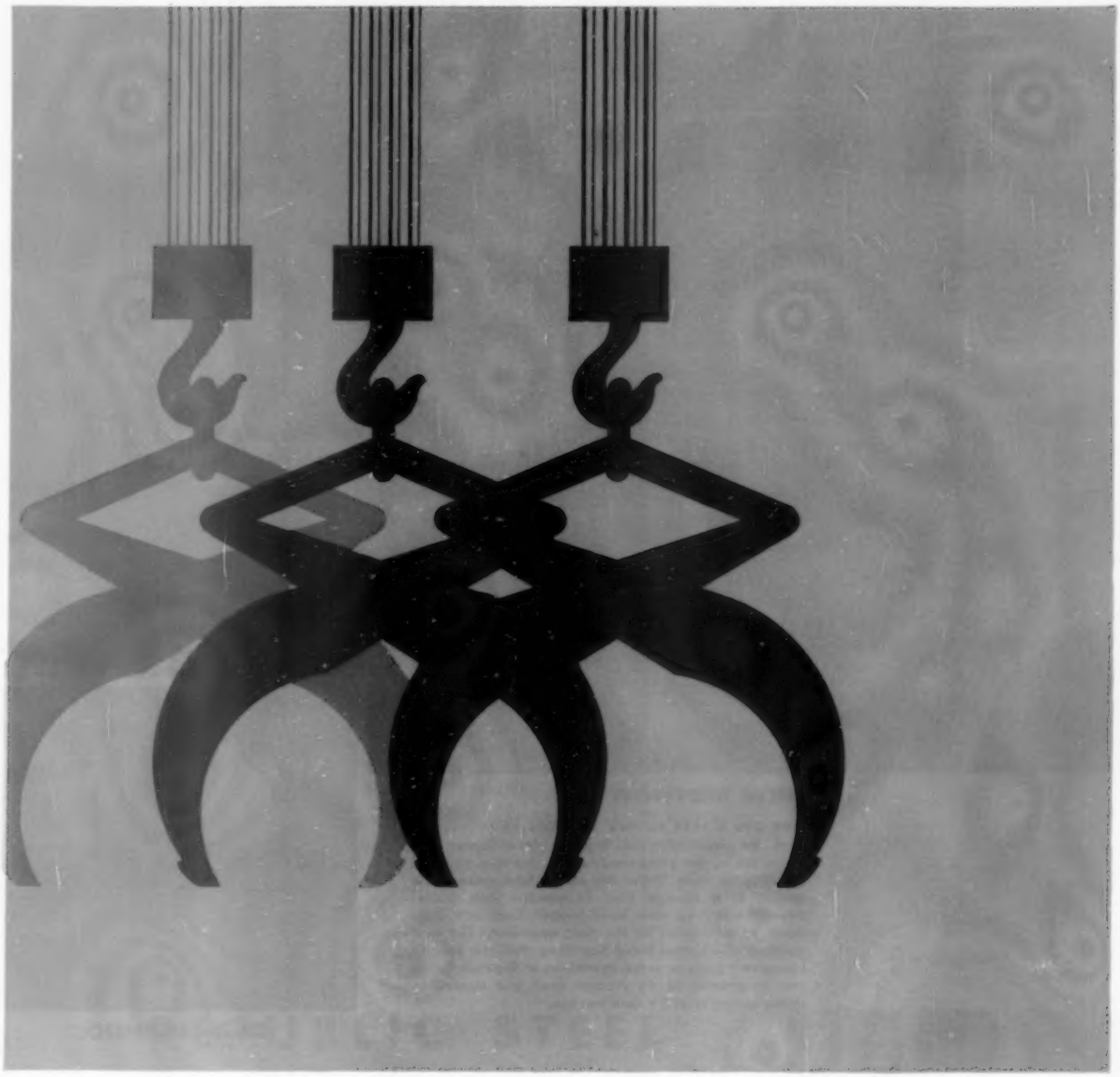
Work lists. Specific time instructions are now drafted for each craft for each major job in the sequence in which it should be done. Each work list shows "when" (date and hour), a brief work description, number of men and man-hours, special counsel, workblock number. Not until this point are critical workblocks distinguished from the others. For these we list a definite clock starting time. Non-critical jobs are listed under the day only, can be done any time that day. For large jobs involving a lot of preparatory work prior to shutdown, CP issues a preliminary work list that covers all details except the exact clock timing. This is left to foremen, subject to a given completion date.

If a shutdown involves repetitive work, the planner specifies use of the same men, if possible. At UCC, when the same people have done the same job two or three times, the resultant increase in productivity has yielded savings up to 50%.

Field application. Copies of work lists and the job schedule go to interested operating and maintenance supervisors. The area maintenance supervisor has access to a copy of the daily schedule board or the job schedule board itself. Craft leadmen receive work lists for their own craft. Planners acquaint assistant supervisors and leadmen with the job location and methods. They also help foremen coordinate the job, especially with shops, engineering, or special elements.

Major jobs usually get priority, to minimize downtime. Assistant area maintenance supervisors (who help plan and schedule the 90% small-jobs workload) make exceptions on emergency small jobs, such as when a shorted switch could tie up a unit. Routine small jobs that can be shifted from day to day and small revision or repair jobs of low priority take up the slack.

We have planned jobs ranging from 100 man-hours to 7000 man-hours (5-day shutdown). We have had 16-hour shutdowns with 150 craftsmen on the job. None of the big shutdowns could have been accomplished in so short a time had it not been for our planning and scheduling system. **END**



Manual and Motorized Sheet Lifters

Manual Low Headroom Coil Tongs

Scissor-type Tongs

Safely • quickly • efficiently Heppenstall can handle it

You'd go a long way to find a lifting or moving operation that hasn't been handled—and handled efficiently—by Heppenstall tongs. You name the load specifications—heavy, light, awkward, massive—and Heppenstall can match it with the right tong. Clearance and headroom a problem? Heppenstall can help with tongs that lift, stack in the tight squeezes and rotate 360°.

Let us know *your* specifications. Write or call direct.

HEPPENSTALL COMPANY
PITTSBURGH 1, PA.
Plants: Pittsburgh & New Brighton, Pa. • Bridgeport, Conn.

MIDVALE-HEPPENSTALL COMPANY
NICETOWN, PHILADELPHIA 40, PA.

H M H

For more facts Circle 482 on Reader Service Card

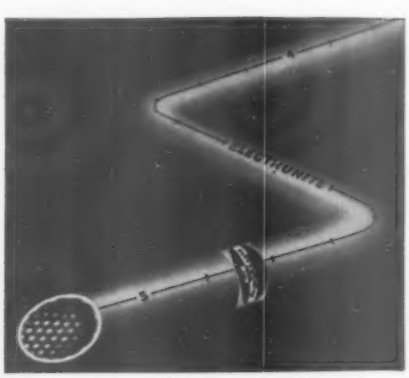
NEW METHOD

TIME AND MONEY SAVING CHANGES which resulted from the installation of Republic Steel Boxes are illustrated by this comparison of old and new material handling methods. Under the old method, parts were hauled to a storage area in wooden shop trucks, counted into bins, then hand loaded back into shop trucks to be hauled to the next operation. The new method eliminates hand-handling. Full job lots of component parts or valve assemblies in Republic Boxes are transported to the storage area and stacked in space saving rows by fork tractors.

OLD METHOD

MORE FUNCTIONAL FEATURES. Republic Steel Lockers are built to meet industrial requirements. Extra roominess, free-flow ventilation, positive latching, double leaf 2″ hinges, Bonderizing, baked-on enamel finish . . . all features that make Republic your best locker buy.

SAVE SPACE, SIMPLIFY STACKING. Republic Pallet Racks are the modern way to stock and store bulky, uneven, and odd-lot materials. Tubular steel supports adjust every six inches. Two-way entry permits loading or unloading from either side.



FUTURE POWER CAPACITY. For the same cost as ordinary threaded conduit (or even less), you can install Republic ELECTRUNITE® Electrical Metallic Tubing in the next larger size, and be ready for increased future power demands.

 For more facts Circle 478 for Material Handling Units, 479 for Metallic Tubing, 480 for Steel Lockers, 481 for Pallet Racks

HOW HENRY VOGT MACHINE COMPANY CUT MATERIAL HANDLING COSTS $30,000 PER YEAR

Multiple hand-handling and bulk storage of parts eliminated with Republic Steel Boxes

From forge shop through machining, assembly, and testing operations, intermediate storage through packing and shipping, Henry Vogt Machine Co., Louisville, has greatly reduced handling and improved inventory control with Republic Steel Boxes.

Vogt, the nation's largest manufacturer of forged steel valves and fittings, credits the new containerization and material handling system with direct savings of $30,000 per year. Hand-handling and counting of parts is virtually eliminated because parts are now efficiently stored in the new steel boxes rather than in stationary bins.

Other indirect savings and benefits have also resulted. Simplified storage and handling have made possible larger production runs. Customers get faster service because most orders can now be filled from stock. The special design permits transportation and stacking by fork tractor, or hauling of one or more boxes on shop trucks.

WHATEVER YOUR MATERIAL HANDLING OR CONTAINERIZATION PROBLEM, Republic's Material Handling Engineers can help you solve it. Republic Equipment is engineered and built to your specific job requirements. Send the coupon for more information.

REPUBLIC STEEL

REPUBLIC HAS THE FEEL FOR MODERN STEEL

Strong
Modern
Dependable

TRAIN OF REPUBLIC BOXES being towed through the warehouse. The boxes are designed for handling either in this way, or by fork tractors.

REPUBLIC STEEL CORPORATION
DEPT. FA-2224-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on the following:

- ☐ Republic Material Handling Units
- ☐ ELECTRUNITE Electrical Metallic Tubing
- ☐ Republic Steel Lockers ☐ Pallet Racks

Name_____ Title_____

Firm_____

Address_____

City_____ Zone_____ State_____

What do you want to control? The flow and measure of 20,000 amperes in an aluminum ore processing plant? (A large static control system will provide pinpoint control—and eliminate the need for direct connections between meter panel and bus bar.) Or do you want to supply exact change in an automatic bill-changer? (A small static control system will do this—and detect counterfeits to boot!) Large system or small, static control can be the answer. ■ We show large and small hysteresis loops to define these systems as *magnetic* static control. Such systems have no moving parts (static), and under normal operating conditions will never burn out or wear out. There is virtually no maintenance needed, almost no heat loss, and fewer components than in conventional systems. Static control systems are used on automobile assembly lines, for annunciator systems, and for controlling the speed of 1/20-hp motors. If you, too, would like to learn what your operating statistics and costs could be by using magnetic static control, write to Magnetics Inc., Dept. **F-87,** Butler, Pa.

INDUSTRIAL CONTROL EQUIPMENT

MAGNETICS inc.

For more facts Circle 483 on Reader Service Card

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FACTORY'S CASE BOOK OF

ENGINEERED PLANT SAVINGS

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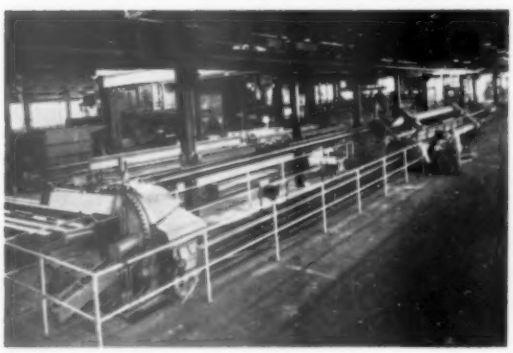

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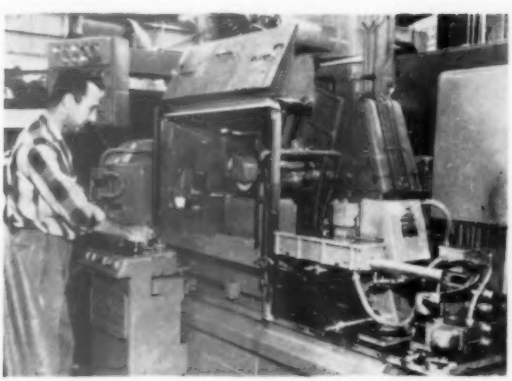

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FACTORY'S CASE BOOK OF

ENGINEERED PLANT SAVINGS

NORMAN H. SOLON, EDITOR

No. 44 July 1961

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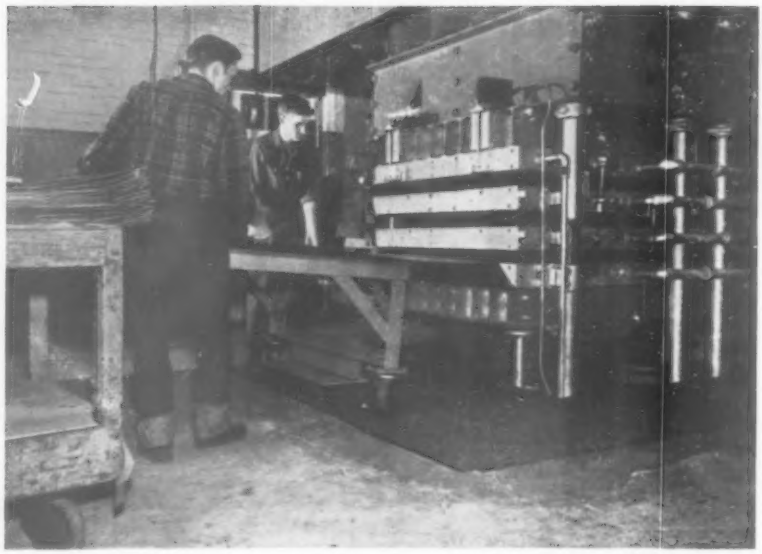


Restless table has three jaws

Plywood sandwiches can be fed quickly into any one of three jaws of this hydraulic press at Artistic Veneers, Inc., Chicago. An automatic positioner with pushbutton control allows the operator to lift the lay-up table into line with the press opening. Here's how it works:

Compressed air at 100 psi. from the plant's compressed air system is applied to the top of a hydraulic oil reservoir beneath the table. This, in turn, forces a cylinder up to lift the table to a pre-set height. For example, when an operator pushes the No. 2 button, the cylinder moves a lifting plate up from the floor, and the table is lifted into position with the first opening of the press. The same thing happens with Buttons 3 and 4.

At the end of the production day, the positioner is returned to floor level by pushing Button 1. This makes it possible to roll the lay-up table out of the way so there's no obstruction on the floor, as there would be if a scissors-type lift were used.

The electro-mechanical positioning unit is manufactured by Hanna Engineering Works, Chicago.

Infra-red oven panels have poor eyesight

They're color-blind anyway, and therefore are doing an efficient job at Mastercraft Trailer Company, Middletown, Conn.

Since products of varying colors go through the paint line here, it's imperative for them to be dried uniformly. Unlike bulbs and tubes, the infra-red panel units operate in wave-lengths not appreciably sensitive to color. Thus, no color calibration settings are needed.

The panel also heats up as a solid mass, which means the product gets uniform exposure.

The 12-ft. oven (Infra-Red Systems, Inc., Riverdale, N. J.) is built up in modules that can be reassembled as production needs warrant.

Rubber-faced steel gives a gentle ride

These trailers haul concrete slabs at Pre-Cast Tile & Slab Company, St. Louis, Mo. Until recently, they were used with dire results.

The concrete slabs lay directly against the steel and the rough bouncing resulted in breakage—about $30-per-month-worth per truck. Materials such as felt were tested for cushioning purposes, but with little success.

The rubber-steel plates made by Gates Rubber Company, Denver, have changed the picture. Since there are 20 trucks, savings total $600 a month.

The plates come in sheets up to 48x144 inches in size. Rubber is bonded to steel in 16- and 18-gauge sheets from ¼ to 1 inch thick.

Need a new roof? Spray and save

A cold liquid spraying method saved Clark Equipment Company $15,000 in re-roofing labor and material costs for its Jackson, Mich., plant. That's 35% less than hand application would have cost.

With the spray method, a three-man crew can cover 175,000 to 250,000 square feet in an eight-hour shift (700 to 1000 square feet per man-hour). For hand application, the most efficient-size crew would be two men, who could cover only 3200 to 4800 square feet in eight hours (200 to 300 per man-hour).

There's no need to lift heating equipment to the roof with the spray method. The materials are homogeneously mixed without heating. It's done this way:

A sealing compound is applied to the roof, followed by the laying of one- or two-ply felt. Then the roof edges are covered with a glass-fiber membrane which becomes embedded in the roof coating. Finally, a silicone liquid roof coating is applied by spray; this will protect the roof for years.

The system was developed by Monroe Company, Inc., Cleveland, which makes the materials involved.

Vending machines cater to butterballs

If too many of your workers are sporting spare tires around their middles, you can do something about it.

Workers—jumbo size—with will power can count their calories at Thompson-Ramo-Wooldridge, Inc., Cleveland. Vending machines at the plant dole out weight-control beverages as well as hot dishes, sandwiches, and coffee.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be sure to include. We'll edit for the Case Book. Contributions accepted will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

A clean story with a new twist

A conveyor that automatically twists itself to reverse top and bottom surfaces of the belt is its own best maintenance man. At least it is at Ohio Power Company's Beverly, Ohio, plant. The turnover system prevents build-up of sticky materials, with resulting damage, on idlers or pulleys.

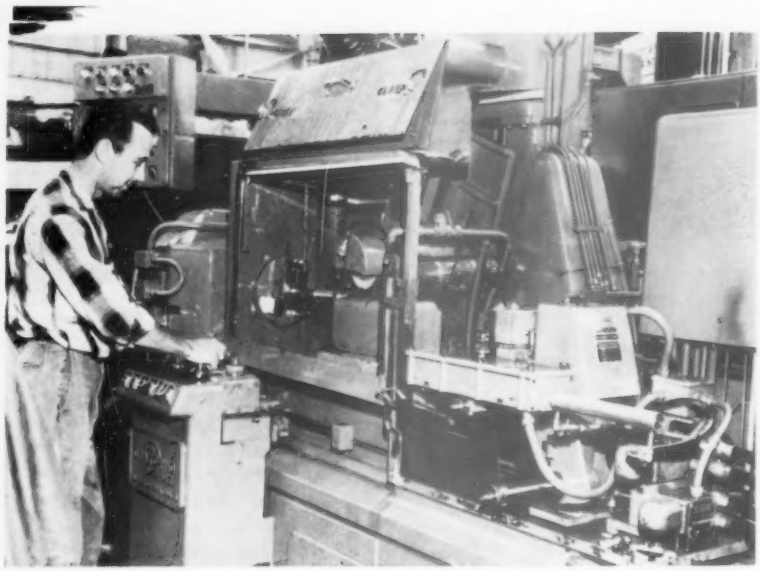
The twist is accomplished by placing two twist pulleys at each end of the belt flight. To keep its clean side on top of the return idlers, the 4480-ft. belt delivers its load, and makes a 180-deg. twist. It then returns to the loading point where it makes another complete twist before reloading. The belt's thick carrying cover is always positioned to receive the load.

The twist system is patented by B. F. Goodrich Industrial Products Company (Akron, Ohio) and can be applied to any conventional conveyor system. All that's needed is space to accommodate the belt turn. No alterations are necessary in the conveyor framework.

Driving bugs buggy

If heat and insects in your plant are bugging you, here are two solutions for the price of one. Five roof-mounted exhaust fans have eliminated both these problems in the mold room at Nichols Engineering, Inc., Shelton, Conn.

The fans change the air in the room every two minutes—which fixes the ventilation problem. They also cause a steady upsurge of air to flow from the windows along both sides of the room up and out through the central ventilating system. So woe to any warmongering mosquito who has a worker dinner in mind. He'll be caught in the airstream and carried to his doom.



Electronic draftsman

Sophisticated engineering drawings can now be produced in split seconds by an electronic draftsman at Stromberg-Carlson, San Diego, Calif. A computer feeds the information to a high-speed microfilm recorder via a mathematical code. The company-made recorder, in turn, draws lines, curves, symbols, and dimensions—all by electronic beams.

The computer can be programed with the contours and specifications of the part to be designed, which can then be transferred to the recorder when needed. The recorder can also provide complex wiring diagrams, layout work, and other processes requiring calculations.

Grinder works at double speed

An automatic external gear-tooth grinder, which machines crowned spherical coupling teeth to high precision tolerances, has doubled output at Bell Helicopter Company's Fort Worth, Tex., factory.

It works with a rocker-arm action that produces a spherical tooth shape —including the root—rather than a straight tooth shape. The rocker arm controls the movement of the grinding wheel while it oscillates through the cut.

Besides boosting production, the automatic downfeed and wheel dressing have increased accuracy. Spherical couplings are being held to a tolerance of 0.0004 inch on the modified involute form.

The grinder was custom-made for Bell by Gear Grinding Division (Detroit), Michigan Tool Company.

Jumbo rubber bands stretch handling $$

These Texas-size rubber bands have cut handling costs to the tune of $1200 annually at Helena Rubinstein, Inc., Greenvale, L. I.

The giant bands are used to hold the top layers of stacks of cartons on pallets so they won't slide or topple when pallets are moved. The bands are up to 1½ inches wide and 6 feet long, and can be stretched to 18 feet.

The company had been using some $800 in masking tape each year to steady the pallet loads. And the tape could be used only once, took time to apply, and often ripped the cartons when removed.

Now these rubber bands are doing the trick. They cost only $544 and can be used repeatedly for about three years. They're easier to apply and remove, resulting in labor savings of approximately $400 a year, and even higher savings through damage prevention.

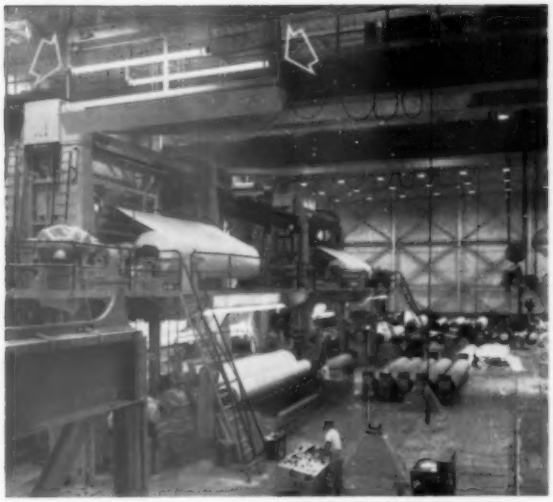
The bands are manufactured by B. F. Goodrich Industrial Products Company, Akron, Ohio.

Bascule bridge beats space barrier

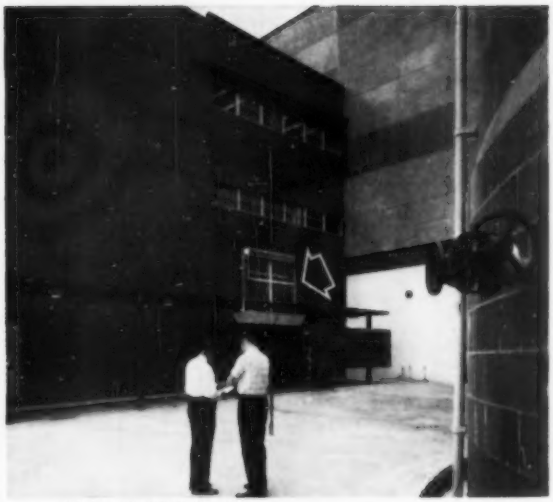
There's no trouble spanning this railroad track despite wide crossover, heavy load requirement, and low ceiling at Tension Envelope Corporation, Kansas City, Mo.

This double bascule bridge forms an 18-ft. span for the passage of fork trucks and other traffic. It will support a load of 15,000 pounds. Each side rises to a near-vertical position through the force of a flexibly connected oil-hydraulic cylinder underneath. The unit is controlled from either side of the track by push-button.

The crossover is located on a curve, which makes it abnormally wide. The low ceiling rules out use of a single-section bridge. A major advantage of the double bascule bridge is that it stands almost straight up, thus doesn't take up valuable space when not in use.



INSIDE THE PLANT . . .



. . . AND OUTSIDE TOO

ELECTRIC CHAIR FOR SABOTEUR BUGS

Insects were bugging up the works at Crown Zellerbach Corporation, St. Francisville, La. Hard shell insects flew into the paper machine and perforated the paper. This led to jamming and machine shutdown every hour for cleaning.

Now this "Circe" machine is luring the flying saboteurs to their deaths. The unit consists of an electric grid, a transformer delivering 3500 volts, and two black lights. The lights have a great attraction for the bugs who are killed instantly on contact with the electric grid, and drop into a collection pan below. Each unit is expected to last 20 years. It can be used either inside or outside the plant building.

Since the installation of the machine there have been no shutdowns due to flying insects. In terms of downtime, this adds up to savings as high as $5000 a week.

The Insect-O-Cutor is manufactured by Gardner International Corporation, Pompano Beach, Fla.

Plant printing pays

Printing its own doughnut-shaped labels has considerably reduced inventory troubles at Weldon Roberts Rubber Company, Newark, N. J. Since the plant makes 2009 different combinations of abrasive wheels, it was quite a problem keeping a sufficient label inventory on hand.

The necessary data were formerly rubber-stamped on pressure-sensitive labels. But impressions were not always clear—were often smudged and messy-looking. Now label inventory has been reduced to a few basic types, preprinted with color coding and standard information. With the imprinter (Avery Label Company, Monrovia, Calif.) new labels can be printed at speeds faster than one per second. This means there will be no problems when rush orders are needed for hot items.

Yes, Virginia, there is a Santa Claus

Two technicians at International Business Machines Corporation, Poughkeepsie, N.Y., shared equally in what probably is the largest suggestion award in business history to date—$56,031. That's a whopping $28,015.50 apiece.

The monster check was presented for an idea that eliminated 14 printed circuit cards from a magnetic unit produced by IBM.

IBM's suggestion system provides a minimum award of $25. The maximum prize makes the old $64,000 Question show on TV look like a piker—a latter-day Thomas Edison can win $75,000.

And, of course, a third person shared in the $56,000-plus award—Uncle Sam.

Rayon chops cost

Packing costs for window frames have been cut from 42¢ to 6¢ at Louvre King, Monterey Park, Calif. Switching to rayon strapping (American Viscose Corporation, Philadelphia) from reinforced filament tape made the difference.

Avistrap protects packages better than the old method, and eliminates the need for costly corner protectors. There's also a safety factor: It has no jagged edges, and doesn't snap if overtensioned.

L-K also uses Avistrap for packaging hardware units weighing up to 100 pounds.

YOU BE THE ARBITRATOR

THE CASE OF

The vanishing overtime

Out of the experience of the American Arbitration Association

In negotiating a contract, management and union at a wire products plant agreed that present starting and quitting times wouldn't be changed "unless production or delivery requirements or extraordinary conditions require changes of hours for limited periods."

This convinced the 10 employees in the shipping department that their 6 a.m. to 3 p.m. shift wouldn't be changed. A few months later, however, it became apparent that at times during the day many shipping clerks had nothing to do. Yet rush orders in the late afternoon had to be done on an overtime basis or put off to the next day. So the company posted a notice to the effect that beginning the following month half the shipping clerks would be on a 3 p.m. to 12 midnight shift.

The union filed a grievance. "The contract doesn't permit changes in shifts except in emergencies," said the shop steward. "This is just a trick to cheat the men out of overtime."

"Look at the contract again," answered the plant manager. "It says we can change starting and quitting times in accordance with 'delivery requirements.' When customers order supplies late in the day we have to oblige them."

Eventually, the case went to arbitration. If you were the arbitrator, how would you rule?

For the actual decision turn to page 156

Plywood boards take aim at indirect costs

These permanent assembly pattern boards have slashed indirect costs at Worthington Corporation's Buffalo, N. Y., plant.

Patterns were formerly made and attached directly to the master match board where they stayed permanently. Now the patterns are mounted on a ¾-in.-plywood insert, which can be attached to a suitable master board in a matter of minutes. When patterns are needed from storage for the production of castings in the foundry, they're quickly mounted on the master.

The lightweight plywood boards can be used for 90% of all operations. This saves materials needed to make a master board for each pattern. It also cuts down on storage space and improves handling.

Giving exotic metals a solvent bath

This plant-made scrub machine (top photo) efficiently removes surface film and grease from exotic thin metal strip produced at Hamilton Watch Company, Lancaster, Pa.

Hamilton formerly used degreasing machines, but found them too large for effective cleaning of extremely thin gauge foil (0.001 inch or thinner) of zirconium or titanium. Also, straight degreasing does not remove surface smudge or film that usually gathers when these types of metal or alloys are rolled. Solvent must be circulated to assure completely clean surfaces.

With the new machine, the strip is cleaned by rotating cloth-buffing wheels (lower photo) with the cold solvent. The Chlorothene solvent (Dow Chemical Company, Midland, Mich.) is pumped through spray nozzles onto the strip. Drying is done through the fast evaporation of the solvent and by drawing the metal through a series of squeegees.

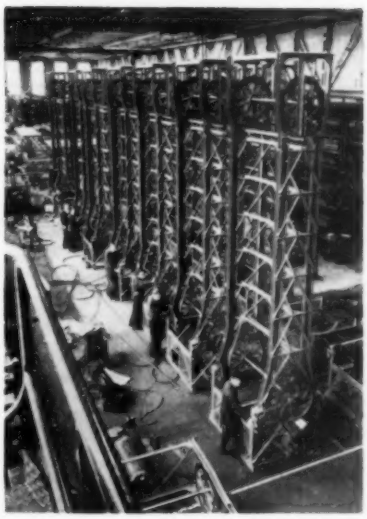
Plant-city relations a two-way street

When selecting a new plant site, all companies ask the question: What can this city or community do for us? But too many consider loyalty a one-way street.

Lone Star Steel Company, Lone Star, Tex., feels that community goodwill is one of its biggest natural resources and gears its public relations program toward that goal.

Since the steel mill is the biggest employer within a 50-mile radius, the municipalities are economically dependent on it. So the company has formed an organization of area bank officials and directors who meet periodically to keep informed on company policy as it affects the local economy. The group is told when the plant is taking on or laying off employees, or planning an expansion move.

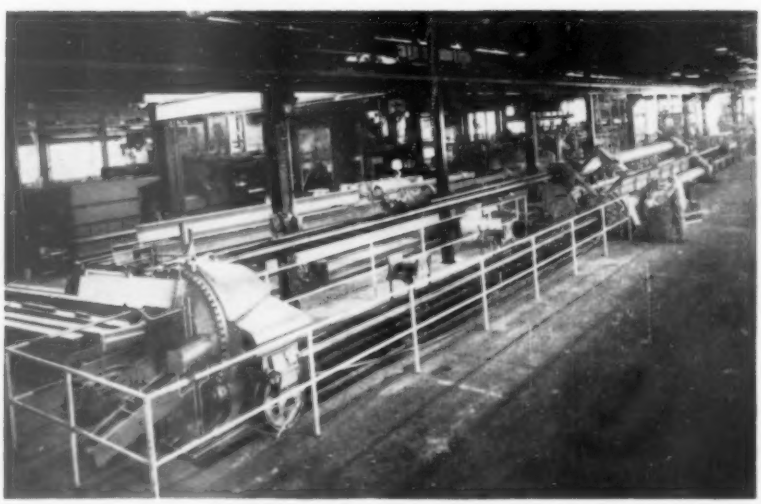
Other moves toward good community relations include the sponsoring of summer college courses for school teachers right on plant grounds with the company footing tuition fees. And members of the clergy are periodically given courses in economics at the plant.



Red-hot idea in Soviet storage

Storage is a pushbutton merry-go-round affair at the recently constructed Soviet rubber and tire manufacturing plant, Dneipropetrovsk (it's spelled right), Russia.

But the powered storage tree is not exactly Communistic in origin. It's produced by George W. King, Ltd., Stevenage, England.



450-TON MONSTER MAKES THE WORLD'S LARGEST DRAW

This giant draw bench handles pipe up to 20 inches in diameter, 40 feet long, and 1 inch thick at Metals Processing Division of Curtiss Wright Corporation, Buffalo, N. Y. Said to be the world's largest, the bench weighs 450 tons and is 166 feet long with rams extended. It has a 44-ft. stroke and can draw tubing to precise inside and outside dimensions. The machine contains a die arrangement that permits pointing the tubing for holding purposes. Usually, pointing has to be done by another machine. The bench is made by Lake Erie Machinery Corporation, Cleveland.

CASE BOOK CAPSULES

Air-conditioning system (American Radiator & Standard Sanitary Corp.) that operates on high input voltage without a transformer has been installed in the Federal Office Building, Albuquerque, N. M. The system uses 4160 volts, saves $20,000 over the conventional transformer type.

Ultra-strength composite materials, which pound-for-pound are three to four times stronger at white heat than any alloy, are now under development at General Electric Co., Philadelphia. Preliminary work is aimed at combining aluminum with sapphire.

Complex electronic equipment can be leased from Technical Leasing Co., San Diego, Calif.

Continuous nuclear measuring device for the control of the burden level of blast furnaces is being merchandised by Cutler-Hammer, Inc., Deer Park, N. Y.

Microwave energy that will send huge amounts of power where wires cannot be strung is now on the threshold of development, according to W. C. Brown of Raytheon Co. (Waltham, Mass.). He spoke at a recent Institute of Radio Engineers parley in New York.

Out of every 540 ideas originating in research areas, only one finally results in a useful product. So says Goodyear Tire & Rubber Co., Akron, Ohio.

Interlock switches that automatically cut current when a cabinet containing dangerous electrical equipment is opened have been introduced by Minneapolis-Honeywell Regulator Co., Freeport, Ill. When the cabinet door is closed, the interlock automatically re-energizes the circuit.

Gamma-ray image intensifier that can detect flaws in 4-in.-thick steel and project them on a TV screen has been developed by Zenith Radio Corp., Chicago, and Picker X-Ray Corp., Cleveland.

Multi-life package

Packaging delicate electronic equipment can be a cumbersome and time-consuming proposition. However, use of this re-usable container has simplified the operation at Autonetics, division of North American Aviation, Inc., Downey, Calif. And has eliminated damage hazards.

The re-usable container (Lockheed-Brown Associates, Van Nuys, Calif.) is specially made for the operation. The quilted product is lowered into the container and secured with bolts to the shock-insulation protector (first two photos).

The container can be manually closed without tools by clamping it into place (bottom photo). It's designed to protect equipment in transit, handling, and storage.

High-priced fan pays for itself

Making a 490-in. fan out of titanium seems to make as much sense as cutting a thick prime rib steak into meat balls. But it has really paid off at Nassau Smelting and Refining Company, New York.

The company has installed a titanium fan—costing $17,000—for exhausting wet hydrochloric acid, ferric chloride, and other corrosive gases. Inexpensive carbon steel fans were used formerly. But these failed after about one week of full operation. Each failure cost the company $1100 in material, downtime, and labor.

A number of materials, including lead, zirconium, and copper, were tested for use as a structural basis for the fan. None proved satisfactory in the highly corrosive atmosphere, except titanium.

The titanium fan and housing now installed were fabricated by Pfaudler Company (Rochester, N.Y.). Despite its relatively high initial cost, the fan paid for itself in the first 15 weeks. And it is expected to repeat this performance many times over. There have been no signs of corrosion reported to date—after four months of uninterrupted service.

Maintenance without machine downtime

Servicing and maintenance of the new 6000-ton forming press at Eaton Manufacturing Company's Marion, Ohio, plant doesn't necessarily mean downtime. Since most of the controls are removed from the immediate work areas, the machine can keep right on producing.

Electrical controls, including the motor, are mounted on the mezzanine, and all hydraulic and pneumatic controls are buried in the pit of the press under the metal sheets. To mount the latter controls on the mezzanine would just invite housekeeping problems since messy leaks could develop.

There's no need for portable ladders or scaffolding, as ladders and catwalks have been installed for mezzanine maintenance work.

Where's your staff? A glance will tell

Too many executives seem allergic to pencils when it comes to signing out. It's too much trouble to sign their names and indicate what time they're returning.

The case of the vanishing staff is no mystery at Bingham Photo Engraving Company, Inc., New York. This wooden register does the trick. As each executive passes the switchboard operator on the way out, he simply moves the peg next to his name to the column representing the time he expects to return. If he's going to be out of the office the rest of the day, he moves the peg over to the extreme left.

Thus, when a call comes into the switchboard for an executive, a quick glance will tell the operator if he's in, and if not, what time he's expected. There's no time wasted in making inquiries.

The register is made by Heirloom Company, Kenmore, N. Y.

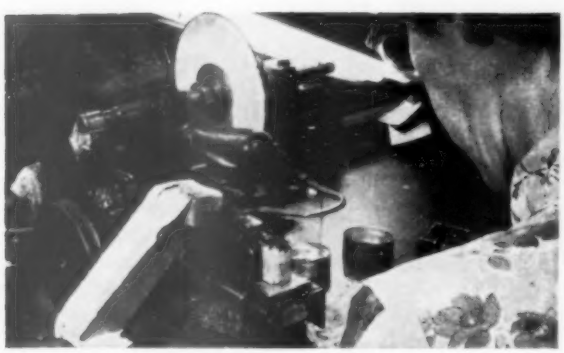
Streamlining plant operations has made a king-size dent in production costs at Hamilton Watch Company, Lancaster, Pa., but with hardly a scratch in the budget. Periodic checks of the plant with an eye to cost cutting do the trick. Here are easily adaptable ideas that enable the watch company to . . .

Tick dollars off production costs

Shoe-bottom shine. This mat is part of the answer to the plant's dust problem. Located at the doorway to the assembly room, the gelatin mat (Merit Sales Company, Boston) cleans the soles of workers' shoes as they walk across it. Maintenance is simple. A daily cleaning with mop and water is all.

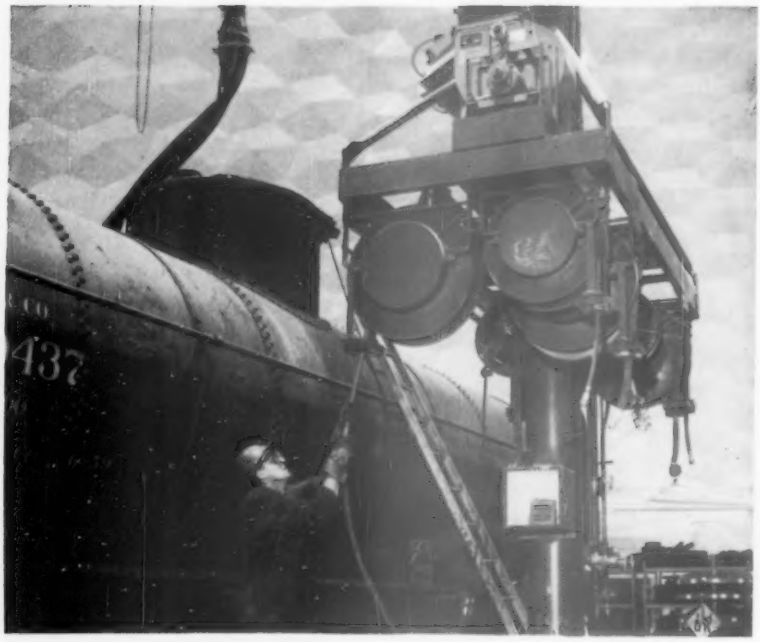
Choo-choo work seats. Chairs on tracks are used when a worker is responsible for a battery of semi-automatic machines. They have cut down on loading and unloading time for each machine and reduced fatigue as well. Here's how they are installed:

Two strips of metal are attached to the floor as rails, and a platform is constructed with wheels on each corner. A chair is fastened on top of the platform and adjusted so the operator can reach machines easily. When the operator wants to travel, she simply pushes the metal foot bar in front. The wheels are set on the track in a 1-in. groove.



Tumbler does two jobs at once. This plant-made tumbler does away with hand brushing for deburring and with a semi-automatic operation for polishing small parts. It consists of a motor, shaft, and pulley set-up with three metal arms to hold several small cans of parts. Various types of abrasives are used, together with a polishing compound. Result: a burr-free polished part quickly obtained.

Parts get the air. Compressed air has ended the time-consuming task of removing finished parts from a semi-automatic machine. And has thereby cut operation time by 25%. The operator formerly used a tweezer to pick the finished part from the machine. Now a blast of heated compressed air coincides with the completion of the cycle, pushing the part into a catch chute, from which it falls into a can of cleaning solvent.



HIDDEN HOSE HANGS HIGH

All hose is handled on 75 spring retractable reels mounted on pedestals 12 feet above the floor at Union Tank Car Company's Wood River, Ill., plant. Capacity of each reel is 50 feet, regardless of hose size. Hose is used for the plant's repair and maintenance operations to handle compressed air, water, steam, and oxygen-propane. With this system, the right hose for each job is always ready for use. The hose is kept off the ground, improving plant appearance, minimizing hose damage and accident hazards. The reels are made by Clifford B. Hannay & Son, Inc., Westerlo, N.Y.

Nurses small parts

There's no chance of sensitive small parts getting bounced around in storage and assembly at Viking Corporation, Newbury Park, Calif.

Plastic boxes slide into these adjustable floor-to-ceiling racks during storage. Lips on the boxes fit cleats on the racks. The same boxes with dividers are used on the assembly line. They come in eight sizes and fit any standard racks.

The Modubox system is manufactured by Hollywood Plastics, Inc., Los Angeles.

Will automation pay at your plant?

It may not. And installing automatic equipment when your operation does not warrant it can be a costly blunder. Don A. Cargill, Cargill-Detroit Corporation, Detroit, suggests these rules as guides in making your decision:

Use automatic assembly machines only . . .

- When the product being manufactured will have a long model life.
- When the operation is cut and dried, with little variation.
- When there is no element of selective assembly.
- When the due date for the machine to begin operation is not essential to the production of the item. (Any fully automated machine is a development.)

A semi-automated machine can be used when the conditions above prevail. The fact that some workers are involved can overcome problems of selective assembly. The use of operators can also reduce development engineering time to allow you to meet a definite due date.

Don't use automated or semi-automatic assembly machines . . .

- Where a given operation has a wide range of probable actions.
- When the individual performance times of a cycle vary, even though the average range is in excess of production requirements.
- When production runs are necessary due to product mix, product derivatives, batch lots of supplies.
- When production operations need continual adjustment.
- When product or process changes are regular occurrences.
- When product is not quite finalized, but production is necessary.
- When the due date for production to begin does not allow for equipment development programs.
- When production is high, but capital budgets are low.

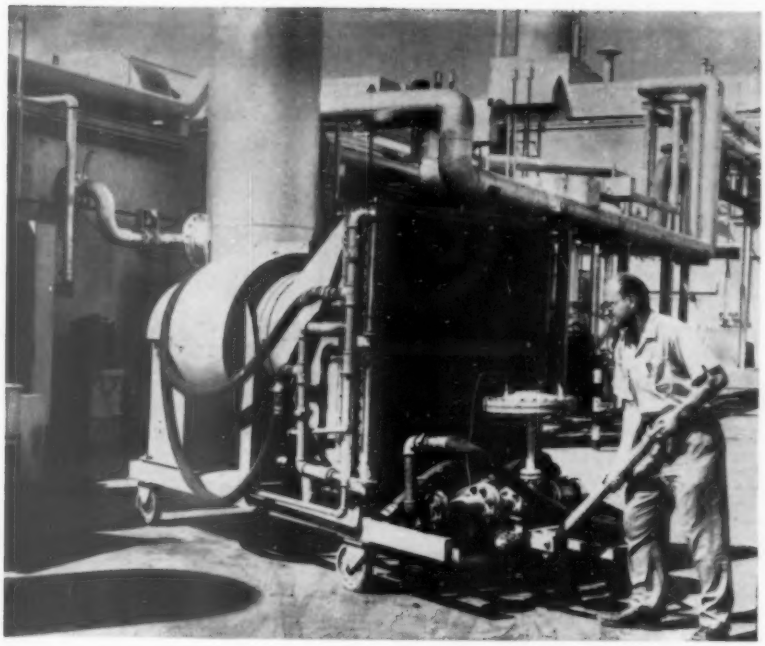
Mr. Cargill presented these suggestions at a recent meeting of the Society of Automotive Engineers in Detroit.

Production story at her fingertips

How'd you like your day's production figures at a glance? And with no chance of arithmetical errors. Fingertip counters are doing just this at Mobile Saw Company, Mt. Vernon, Ala. You press the button on a counter and it advances one unit. Each counter can be re-set to zero when desired. No pencil or bookkeeping work is involved.

The gal in the photo works for Pekett Headwear Company, New York. She's using the counter to chalk up sales for each of 300 combinations of products. The device can also be used for inventory control.

The counter is made by Veeder-Root, Inc., Hartford, Conn.



Air conditioning on wheels

This mobile air-conditioning cart solves the problem of inlet temperature control at Garrett Corporation's Phoenix, Ariz., plant. Gas turbine engines can be tested despite the blazing hot Arizona sun.

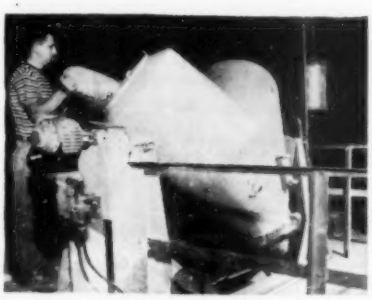
Inlet temperatures for the turbines must be maintained at 60 F., even when outside thermometers hover around 110 F. It would require a high capital expenditure to equip each individual test cell to control its own inlet temperature.

This is a rather special application, but the air-conditioning system on wheels can be used in any plant needing temperature control in different areas at various times.

The system is divided into two sections. The first consists of a fan assembly and coil unit (American Radiator & Standard Sanitary Corporation, Detroit). The fan draws ambient air across the cooling coil which is provided with water from a cooling tower. This part of the system produces 90 F. air.

The second section consists of a plant-made compressor and turbine driven on a common shaft, and a heat exchanger. Refrigerated plant air at 70 F. is ducted into the compressor, resulting in a temperature increase to 340 F. Then the air is forced through the heat exchanger, which also receives water from the cooling tower. This reduces the temperature of the compressed air to 130 F. The air is then expanded in the turbine resulting in an air temperature of minus 65 F. at atmospheric pressure.

When the low temperature from section two is mixed with the 90 F. of section one, the result is the 60 F. needed for engine testing.



Blender works in hours, not days

A custom-designed blender has slashed the floor-tile production cycle from five days to under four hours at Wenczel Tile Company, Trenton, N. J. The 2-cu.-ft. machine (Patterson-Kelley Company, Inc., East Stroudsburg, Pa.) accomplishes this partly by eliminating extensive raw material handling from the manufacturing process.

It used to take a full day to prepare a 5000-lb. slurry batch and then to load and mill it. After that it took a three-day drying period to remove most of the water that had been added in the preparation of the mix. Cleaning all the apparatus took another day.

The only similarity between the new blending process and the old is that both use the same type of raw materials, coloring agents, and water. Now 800 pounds of floor-tile mix can be produced with the blender in 28 minutes. It takes less than four hours to produce 5600 pounds of mix from seven batches.

The cycle consists of 7 minutes for loading, 10 minutes for dry blending, 2 minutes for tumbling, 2 minutes for addition of water, 5 minutes for mixing, and 2 minutes for post blending.

The P-K blender permits a continuous operation, from insertion of raw materials to finished mix.

Rapid robot reader racks rich rewards

An optical scanning reading machine has cut the stream of paperwork needed to total up employee piecework payments at B. Kuppenheimer & Company, Inc., Chicago.

With the old method, each worker clipped a work coupon attached to the bolt of material or cut section he was working on. He stuck the coupons on a sheet of gummed paper and turned them in at the end of the work day. It was then up to a girl to total the information on the coupons and make up punched cards to be fed into a computer. The reader, however, has eliminated all these tedious intermediate steps.

The worker now just has to detach his coupons, and at the end of each day they're collected and sent through the scanner in one lot. The scanner reads the operation number, quantity, and incentive rate on each coupon. Then it automatically transmits these data onto a punched card for feeding into the IBM 1400 series computer.

The scanner is manufactured by the Farrington Manufacturing Company, Needham Heights, Mass.

Bubble-gum dispenser guards small parts

When you need a fistful of small parts at Rohr Aircraft Corporation, Chula Vista, Calif., you just twist the knob of this bubble-gum machine. You don't even need a penny.

Besides doling out parts in measured quantities, this fugitive from a candy store also aids in housekeeping. The funnel and bottle below the vending machine catch any parts that might slip through the fingers. These can be returned to the machine periodically, cutting down on floored hardware.

There's no mystery about gauges at G-E

It's not expensive to set up an efficient gauge control system at your plant. All you need is access to punched-card sorting and printing equipment. That's how it's done at General Electric Company's Morrison, Ill., plant.

The system is simple and versatile. Here's the way it works: All non-standard gauges are represented by punched cards in a master deck. A card is completed and punched when the gauge is initially purchased and inspected, and becomes its permanent record.

Each of these cards contains the following information:

1. Manufacturer.

2. Description. Tells what it's used for.

3. Gauge number. Identifies specific instrument from all others. The number is also permanently recorded on the gauge itself.

4. Review schedule. Indicates when the gauge is due for review and calibration.

5. Location. Shows where the gauge is being used. All manufacturing and inspection areas are identified by code numbers. Outside vendors are also coded so that gauges used by suppliers can be included in the system.

6. Acquisition date.

7. Signature and date. Tells who completed the card and when the information was recorded.

8. Cost of the gauge.

9. Device used. Identifies the device that uses the part or assembly checked by the gauge.

10. Type. Indicates the type of gauge by code number. For example 51 = force gauges, 52 = cam gauges, and 53 = limit-type gauges.

11. Calibration record and additional remarks.

Items 2, 3, 4, 5, 6, 8, 9, and 10 are key-punched into the cards, so they can be sorted by category. Items 1, 7, and 11 are recorded on the card but not punched.

Why use this system? It can pay off in several ways. The entire gauge inventory can be summarized quickly in location, thus recording exactly how many and which gauges are in each manufacturing area. This also tells you which ones are due for calibration.

Since the gauges are listed by device, your quality control and production engineers can see at a glance the status of each.

In short, it will give you comprehensive gauge records at your fingertips without tedious searching.

Source: Ronald C. Roth, Quality Control Engineer, General Electric Company, Morrison, Ill.

Reprints of the Plant Operations Case Book are available. Price 50¢. For quantity prices, write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.

YOU BE THE ARBITRATOR

Continued from page 150

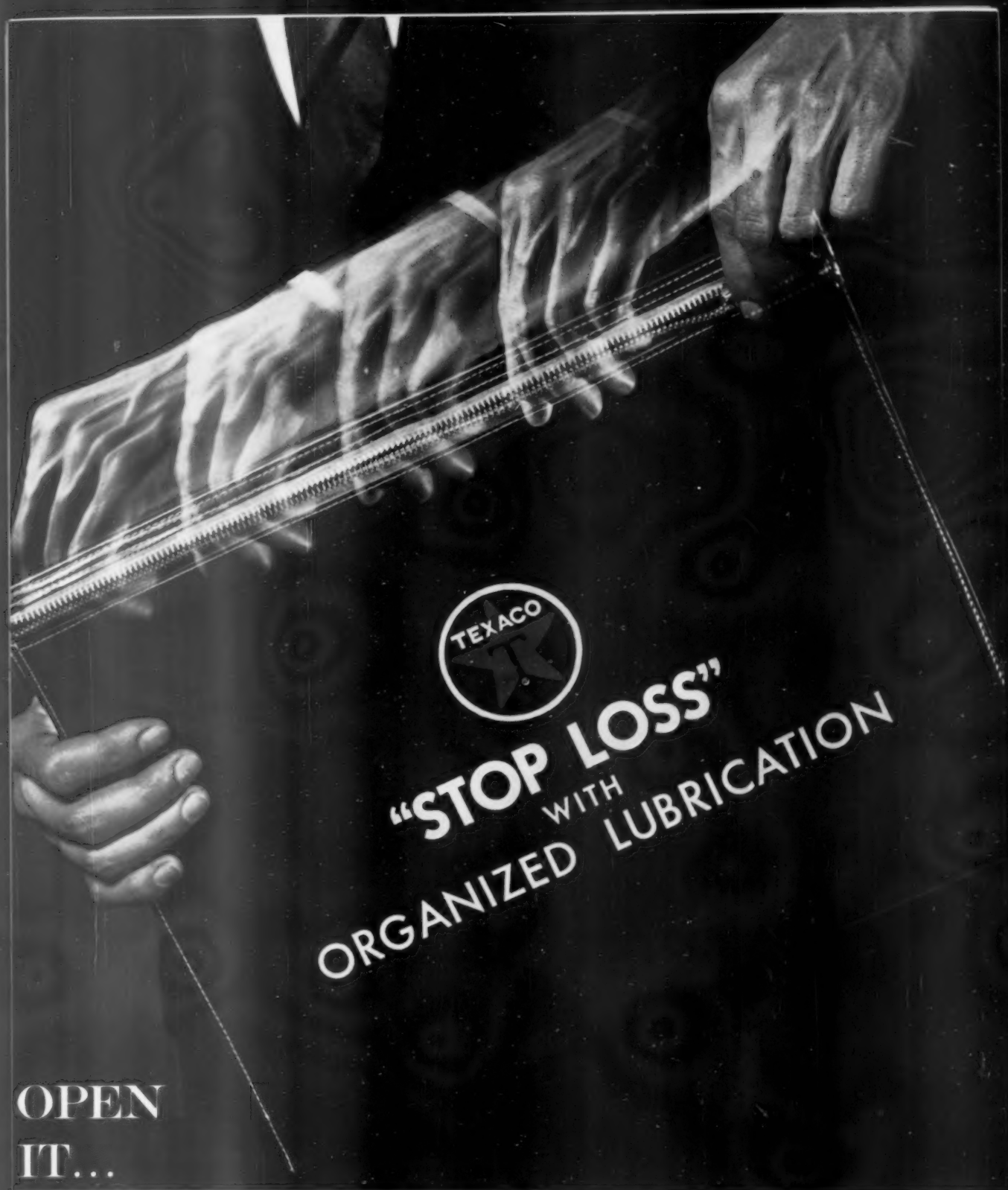
The award—The arbitrator said the change was made for the purpose of securing a more economical distribution of manpower. However, in view of the restrictions of the contract, this aim was not in itself sufficient to justify the change, since the conditions that prompted management to set up a new shift already existed when the contract was negotiated.

Caution: The award in this case is not an indication of how other arbitrators might rule in other apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.

Pads oust bolts on this press

No expensive bolting is required for this 250-ton press at Ebco Manufacturing Company's Columbus, Ohio, plant. The press is mounted on oil-resistant neoprene pads (Isomode Division, New Haven, Conn., of Textron Electronics, Inc.)

The neoprene pad also cuts down noise and vibration, reducing stress on both equipment and building. If the press had to be moved, relocation costs would be 50% less than for a bolted machine.



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TEXACO

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NEW PENNTROWEL® *LATEX* cuts floor resurfacing costs

Penntrowel Latex, a resilient Portland cement-latex mixture, is the new, easy way to apply a durable, economical floor surfacing in industrial plants, institutions and commercial buildings.

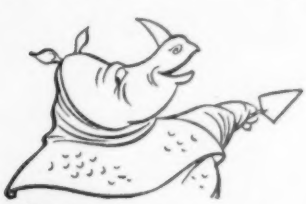
Easy to use: Requires only that sub-base be sound and clean. Penntrowel Latex bonds to many surfaces, including concrete, masonry, sealed wood and metal. It's self-curing, ready for traffic in 48 to 72 hours.

It's economical: Only ¼-½ inch topping is needed for most installations; saves material, labor, weight. Durable . . . long life expectancy. Minimum maintenance, no dusting.

It's rugged: Withstands wear and impact. Resistant to spillage of most oils, greases, fats, dilute acids and alkalis.

In addition, Penntrowel Latex is safe; non-flammable, non-toxic, provides slip-resistant or skid-proof surface. Moisture-proof, sound deadening. Natural concrete color minimizes visibility of patch jobs and partial resurfacing.

Penntrowel Latex is the latest in Pennsalt's line of industrial floor surfacing materials. Others are: resinous Penntrowels resistant to corrosion and thermal shock . . . Color Penntrowel for decorative effect . . . Penntrowel Floor Surfacer grade for heavy vehicle traffic . . . and special Penntrowel for fluoride service.



Penntrowel—
Rugged as a Rhino

Write today for complete information.

PENNSALT CHEMICALS CORPORATION

Corrosion Engineering Products Dept. • Natrona, Pa.

SEE YOUR LOCAL PENNTROWEL DISTRIBUTOR

for information or free estimates on complete installations

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A. F. Seabrook

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WINTER PARK, FLORIDA
Robert C. Kany

Pennsalt® Chemicals
ESTABLISHED 1850

For more facts circle 484 on Reader Service Card

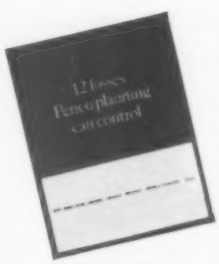
How many of these 12 losses can you cut with Penco-Planned shelving & lockers?

- ☐ Product Damage
- ☐ Excessive Handling Costs
- ☐ Waste Space
- ☐ Slow Order-filling
- ☐ Poor Inventory Control
- ☐ Insurance Costs
- ☐ Pilfering
- ☐ Accidents
- ☐ Production Bottlenecks
- ☐ Shipping Bottlenecks
- ☐ Plant Cleaning Costs
- ☐ Low Employee Morale

If your company is considering new shelving and lockers, look into Penco Planning before you buy. Your Penco representative can show you how Penco units can be used to control *up to 12 major drains on efficiency and profitability* . . . if your operations and requirements are studied in advance. Re-check the list above! The secret is not how many units you buy, but how well units are integrated into your operations as functional systems. Check the Penco installations shown here. Then get more details in our free booklet "12 Losses Penco Planning Can Control". It's filled with slants on how to make storage facilities pay off. Finally, before you buy any lockers or shelving, call your nearby Penco dealer for advice and for fast, efficient service.

One look tells you that these Penco-Planned lockers step up employee morale, cut housekeeping costs.

New Penco T-Line boltless shelving above covers 48,000 sq. ft. . . . speeds handling of 15,000 production items. It simplifies inventory of parts in process, and permits fast changes of layout. No tools are required.



SEND FOR THIS FREE BOOKLET TODAY

ALAN WOOD STEEL COMPANY
PENCO DIVISION 424 Brower Ave., Oaks, Pennsylvania

Please send free booklet, "12 Losses Penco Planning Can Control." (No obligation, of course.)

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Please send also: ☐ General Shelving Catalog ☐ General Locker Catalog

IDEAS OF THE MONTH

By Lewis K. Urquhart, Consulting Editor, FACTORY

For more data, circle item numbers on Reader Service Card next to back cover.

Make lotsa phone calls? Call same numbers frequently? Why not get one of two automatic dialers (*Bell System*) coming later this year? One is single-unit card dialer; other is "Rapidial" which functions as auxiliary to regular telephone. Both minimize dialing errors, speed mechanics of telephoning. **(236)**

How to reduce glare, brightness, solar heat. Revised folder (*L-O-F*) points out that direct rays of sun can cause body discomfort, boost air-conditioning costs. Suggests heat-absorbing and Parallel-O-Grey glass as remedy. **(237)**

For 2½ to 3¢ a pair you can supply workers with sanitary and disposable gloves (*Research Associates*) made of Visqueen polyethylene film. **(238)**

Tap buying is a breeze if buyer consults color-keyed tap selector booklet (*Besly-Welles*). Three quick steps simplify specification of proper tap to use in 75% of all tapping applications. **(239)**

Booklet of the Month is "Tables & Formulae" (*Automatic Electric*). It contains much engineering information in handy form. Things like conversion of inches to millimeters and *vice versa*, binary numbers, prime numbers and factors, powers of numbers, square, cubes, roots. And many others. **(240)**

With HandsFree intercom phone (*Tele-Norm*) you press button to actuate amplification mechanism. Phone receiver then acts as microphone. Loudspeaker connected to phone broadcasts incoming calls. **(241)**

Hot weather suggestion: salt tablets (*Medical Supply*) in expendable transparent plastic dispensers with air lock to shut out moisture. **(242)**

No time to read? Better skim through "Why, When, and How to Read Business Publications," a small booklet (*Wittner*) aimed at helping you keep up with that tall stack of mags on your desk. **(243)**

Litter-Butt (*Alexander*) has half-gallon reservoir of water for cigarette butts and separate compartment for litter. It's stainless steel, 10 in. in diameter, 18 in. high. Free-standing floor model or wall-mounted unit. **(244)**

Vertical conveying troubles? Freight elevators too slow? Not enough room for inclined belt? Good solution: Escaveyor (*Standard*) which loads and unloads itself in motion. Space-saving secret: Platforms assume vertical position for return trip. **(245)**

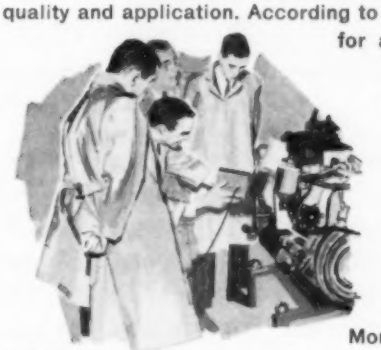
Turn the page

This is AMERICAN OIL COMPANY

Our organization has more than 70 years' experience in the oil business. We are one of the largest petroleum organizations in America.

We believe the experienced American Oil representative who calls on you, plus the products and facilities which he has at his disposal, are reasons why you will like to do business with us.

Your American Oil representative receives special training for his job at our Sales Engineering School. He is given concentrated basic instruction in all phases of petroleum product quality and application. According to a planned schedule, he returns for an advanced course and then again for post-graduate work.

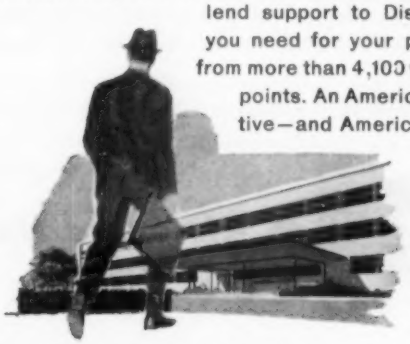


In our Marketing Technical Service Department are specialists who are recognized authorities in their fields. These senior consultants may be called in to work with you on any specialized problem.

More than 1,000 research scientists and technicians are at work in our research laboratories developing new products and finding ways to improve present products. Their mission: To help your American Oil representative help you lower your maintenance costs and stretch your maintenance dollars.

Twelve American Oil refineries give flexibility to the production of petroleum products for industry. They help make it possible to assure prompt delivery. Upwards of 2,875 miles of product pipelines augment delivery facilities.

American Oil representatives operate from 74 District Offices. Thirteen Regional Offices strategically located throughout the country lend support to District Offices. The products you need for your plant or fleet are available from more than 4,100 warehouses and distribution points. An American Oil Company representative—and American Oil products—are only a telephone call from your office. We invite you to make that phone call. Or write **American Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.**



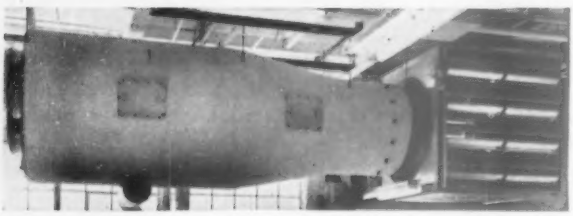
AMERICAN

AMERICAN OIL COMPANY

For more facts Circle 486 on Reader Service Card

SUCCESS STORY

of a revolutionary air conditioning system!



CARRIER ROTASPRAY units require less than ⅓ the space of a conventional system of the same capacity—may be ceiling hung, wall cantilevered or mounted on the roof.

Six years ago Carrier pioneered an entirely new concept in air conditioning for industrial applications—the Rotaspray Weathermaker* System. It is now in operation in such widely different fields as textiles, plastics, rubber, candy, steel, cigar, paper, leather and garment. What is its record of performance? The best indication is the many repeat orders we've had . . . and are getting . . . from satisfied users. Can you use the Rotaspray System to advantage? Here are some of many reasons why it may be the best answer to new construction or reconversion problems.

UNITARY DESIGN. Instead of complete central station systems which require larger apparatus rooms, Rotaspray units are spotted conveniently throughout a plant. Only one central water handling apparatus is required.

FLEXIBLE INSTALLATION. Because of the compactness and low operating weight of Rotaspray units, they can be installed either ceiling hung, wall cantilevered or roof top mounted.

LOW MAINTENANCE. Rotaspray units incorporate self-cleaning "Cant-Clog" nozzles and a self-cleaning eliminator. Compared with large central station systems, they reduce cleaning and maintenance costs as much as 80%.

LONG LIFE. Rotaspray units are fabricated of stainless steel and other durable materials to assure years of virtually trouble-free operation.

HIGH EFFICIENCY AIR CLEANING. Each Rotaspray unit separates dust and other particles from the air . . . assures a "scrubbed clean" air supply at all times.

BETTER TEMPERATURE AND HUMIDITY CONTROL. By a new control method especially designed for the system, the old method of dew point control has been eliminated. Zoning control has also been eliminated. Each Rotaspray unit accurately controls temperature and humidity in its own area.

For complete information, write Carrier Air Conditioning Company, Syracuse 1, New York. In Canada: Carrier Air Conditioning Ltd., Toronto 14.

**Reg. U.S. Pat. Off.*

Carrier Air Conditioning Company

For more facts Circle 487 on Reader Service Card

For more data, circle item numbers on Reader Service Card next to back cover.

Most older workers need help in preparing for retirement. You can give them a boost by seeing that copies of "Retirement Planner" are mailed to their homes. This newest service (*Retirement Council*) consists of series of 24-page booklets full of practical ideas and suggestions. **(246)**

Your heating and power costs can be cut appreciably without capital investment. And your savings will pay rental. That's the promise conveyed by 4-page brochure (*Iron Fireman*) describing new lease plan. **(247)**

Magnetic sheet floater (*Dings*) separates stacked sheets in pressing, punching, spotwelding, similar operations—for safer, faster handling. **(248)**

What is plant and equipment planning? Why should you and your company be concerned? See revised edition of general information manual (*IBM*) which tells you practically everything you need to know, shows how IBM machines and methods are used to control this function. **(249)**

More light in small space is what you'll get with new square-panel fluorescent lamp (*General Electric*). Designed to fit module 12 in. square, it can be used singly or in groups, lends itself to built-in, surface-mounted, and free-standing applications. Waffle-pattern with 1¾-in. squares makes lamp attractive whether lighted or unlighted. **(250)**

With Turnafork attachment gas-operated fork lift truck (*Automatic*) handles loads on pallets or by means of clamps. Driver doesn't have to leave seat to change position of forks. Capacities: 3000 to 10,000 lb. **(251)**

Jacket and pants of yellow nylon neoprene (*Goodrich*) weigh half as much as other protective work suits, yet are four times stronger. **(252)**

Why write in dark when you can buy yourself a flashlight clipboard (*Mutual Engineering*)? Where it's hard to see, flip switch. Five sizes: invoice, 7x12; letter, 9x13 and 9x14; legal, 9x16 and 9x17 inches. **(253)**

Menu for Dishwashing is colorful 12-pager (*Calgon*) which describes washing cycle in detail—scraping and sorting, racking, pre-rinsing, washing, final rinsing. With tips for improving each operation. **(254)**

How to train electronics personnel is brochure (*Cleveland Institute*) you ought to read if this chore happens to be on your docket. **(255)**

Look, Ma, no cavities that can't be inspected. Medical-type inspection set (*Ealing*) consists of 17 interchangeable components, places high-intensity light ray in selected area, provides operator with image of lighted surface. Accessories include magnet and hook for fishing out lost objects. **(256)**

Turn the page

For more data, circle item numbers on Reader Service Card next to back cover.

Engineered equipment lease is 16-page illustrated brochure (*U. S. Leasing*) which tells you all you need to know about conservation of capital and credit, tax-timing credits, balance sheet effect, cash flow improvement, recovery of capital through sales and lease-back. **(257)**

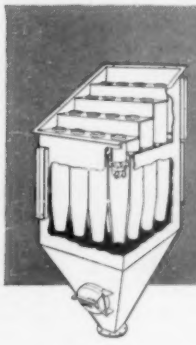
Improved platform ladder (*Dayton*) has side rails secured to each other by metal strap hinge. Shorter rail serves as brace. Result: greater rigidity and safety, longer ladder life, more compact folding and storage. **(258)**

Disposable wipes (*Hoffmaster*) are 4-ply cellulose. Lint-free, scratch-proof, can be used on precision parts, highly polished surfaces. **(259)**

Save drafting time with see-through Draftstamps (*Krengel*). Set contains 32 widely used electrical symbols. Each stamp is mounted on Lucite. Built-in "crosshairs" assure perfect positioning. **(260)**

Hotspot is handy-dandy soldering tool (*Standard Automation Products*) that heats itself with tiny cartridge located in tip. **(261)**

Turn the page



Traps MORE dust at LESS cost
MULTICLONE mechanical dust collector

If **cyclonic collection** will clear your dust problem—a **Multiclone** by Western Precipitation will do it best.

HIGH EFFICIENCY. Multiple **small**-diameter collectors—a WP-pioneered feature—generate greater centrifugal forces for higher separating efficiency.

MORE ECONOMY—all along the line. Basic cost, installation, housing, maintenance all are less. No costly, complicated ducting. Highly adaptable units can often be fitted into existing structures. No moving parts—and cast iron tubes and vanes **last.**

MORE INFORMATION? For literature, write Western Precipitation, 1000 West 9th Street, Los Angeles 54, California. (In Canada write 8285 Mountain Sights Avenue, Montreal, P.Q.)

Dust and fume control since 1907
WESTERN PRECIPITATION
DIVISION OF JOY MANUFACTURING COMPANY

JOY ELECTRICAL CONNECTORS
outlast attachable connectors
12 to 1!

FREE - COMPLETE RESULT AND ACTION PHOTOS OF GRUELLING TORTURE TEST!

Joy molded-to-cable and competitive attachable connectors were tested on a revolving torture wheel to determine fatigue resistance. Conclusive results prove Joy connectors outlast competitive models 12 to 1 . . . save your money with much longer life, less down-time, fewer repairs.

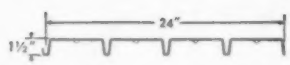
Get proof of real connector durability and savings . . . *write Today for test details* (Bulletin F52).

CD 660.2
JOY ELECTRICAL PRODUCTS DIVISION
1245 Macklind Ave., St. Louis, Mo.
Exec. Offices, Henry W. Oliver Bldg. Pgh., Pa.

For more facts Circle 488 on Reader Service Card

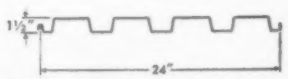
For more facts Circle 489 on Reader Service Card
Circle 490 on Reader Service Card for items on page 165

When it comes to roof systems, INLAND covers everything!



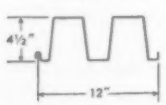
A-DECK — For purlin spacings not exceeding 8'4". Narrow ribs provide deck surface that supports the thinnest or softest type of insulation.

H-DECK — New! For simple spans from 10'0" to 20'0" — 3 and 4½" depths. Especially practical to cover walkways in shopping centers, schools, other installations.



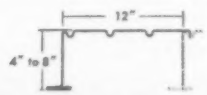
B-DECK — For spans to 10'0". Wide rib distributes metal for greater structural efficiency — gives higher section properties per pound of steel — well suited for use as side wall panels.

B-ACOUSTIDECK — Two-in-one panel combines steel roof deck with acoustical ceiling having Noise-Reduction Coefficient of .70 — used for spans to 10'0".

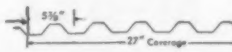


C-DECK—Carries normal roof loads over spans up to 24'0". Used extensively in canopies.

C-ACOUSTIDECK — Offers same Noise-Reduction Coefficient as B-Acoustideck. Can be used for spans to 24'0".



T-STEEL — New! Galvanized only — for clear spans to 32'0". Adaptable to acoustical and flush, luminous ceiling treatments. Provides superior diaphragm to transmit seismic and wind loads.



RIBFORM — High tensile galvanized steel form for concrete slabs over spans up to 8'0". Three types: Standard, Heavy-Duty, Super-Duty.

Whether your design calls for a dry insulation board roof or for wet-fill, there's an Inland roof system for the job — by the makers of famous Milcor steel building products.

Inland steel deck weighs less than half as much as poured-in-place or pre-cast construction. You can space joists wider and use lighter framework, to save both time and money. Panels are easy to handle and weld in place — in any weather that a man can work.

Types A, B, C, and H decks have the additional advantage of a Bonderized, baked-enamel prime finish that resists on-the-job damage. One field coat of paint on these Inland decks usually covers.

Write for catalogs 248, 240, 241, and 245—or see Sweet's sections 2i/Inl, 2c/Inl, 11a/In, and 2a/In.

member of the INLAND steel family

ENGINEERED PRODUCTS DIVISION

INLAND STEEL PRODUCTS COMPANY

Dept. G, 4119 West Burnham Street
Milwaukee 1, Wisconsin

EP-1A

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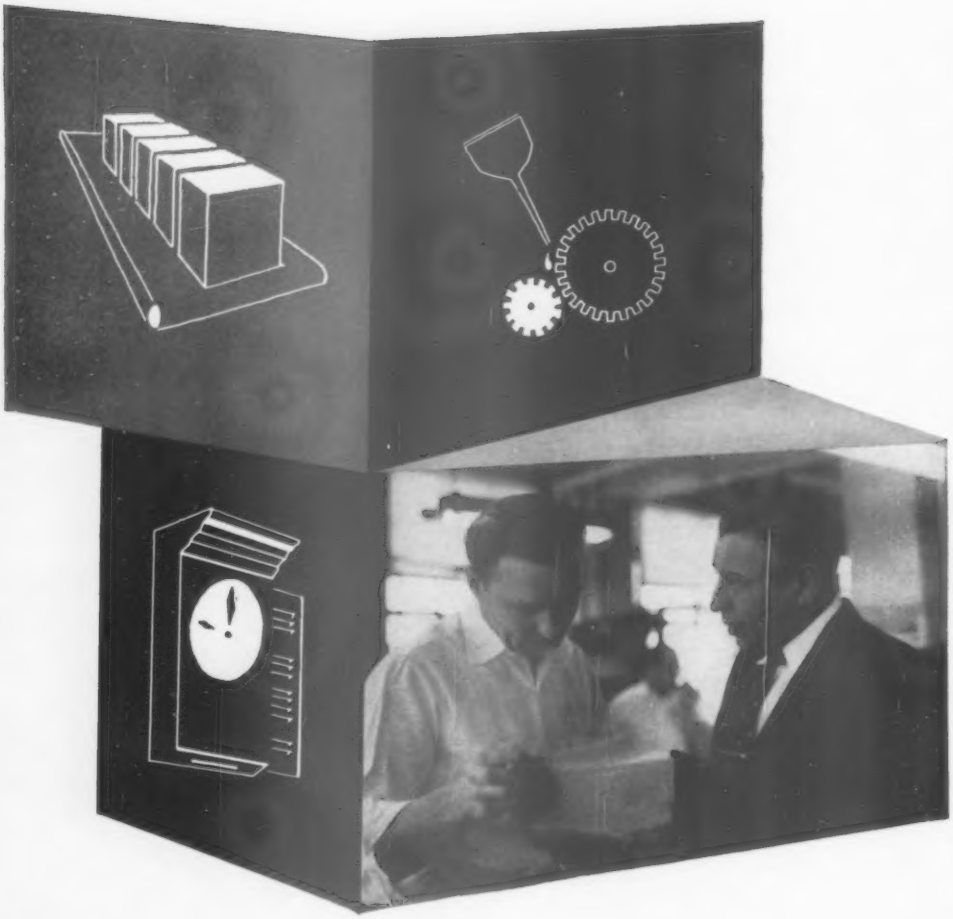

NOW! A LOW-COST WAY TO AUTOMATE LABOR COSTING

KEYSORT® DATA PROCESSING

To market a product competitively – and to make a profit–requires control of labor costs and distribution. Figures must be readily available. Yet most data processing systems are either too expensive or too complicated for plant operation. Except Keysort.

Designed for economical plant control

Keysort is the only automated data processing system flexible enough to fit your company as it stands *and* as it grows. It is the one system adaptable and affordable to companies of every size. Anyone can use Keysort with only minimum training. It imposes no restrictions on plant operations, yet provides management with the full range of reports–labor costing, production control, inventory, lost time analysis, etc.

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Keysort cards are mechanically created and code-notched with your vital information. Classification and sorting are rapidly accomplished. Figures are automatically tabulated and summarized direct to reports–drastically reducing clerical burden. Management gets the information it needs *on time*. And at lowest cost.

Read about Keysort in action

Your nearby Royal McBee Data Processing Systems Representative will be happy to sit down with you, your plant managers and your foremen, to discuss a low-cost Keysort system tailored to your requirements. Call him, or write us at Port Chester, N. Y.–indicating the applications in which you are interested–and we will supply you with actual case histories from our files.

ROYAL McBEE *corporation*

NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

For more facts Circle 491 on Reader Service Card

For more data, circle item numbers on Reader Service Card next to back cover.

Automatic carton selector (*Atronic*) identifies 31 different types of packaged products on moving conveyor—at speeds up to 200 fpm., sorts and diverts them to any one of 31 possible destinations. If desired, you can route several different products to one destination. **(262)**

To mark location of protective or safety equipment, self-sticking diagonally striped panels (*Brady*) look like good bet. Panels are vinyl plastic. Stripes are yellow and black. Sizes: 5½x17, 11x17, 17x17 inches. **(263)**

Water drill (*Eynon-Dakin*) enables gardener to saturate roots of trees and shrubs at depths to 4 ft. Jet nozzle needs no hand pressure. **(264)**

Good leak stopper is pipe-joint compound (*X-Pando*) that expands as it sets—in any temperature. Withstands high pressures and temperatures. **(265)**

Just in case you missed corrosion computer (*Harper*) announced in Dec. 1960 *Ideas*, it's still yours for asking. This 4x4-in. slide chart tells how each of 8 types of metal (all commonly used in mechanical work) withstands corrosive effects of 141 chemical agents. **(266)**

For more facts Circle 492 on Reader Service Card

Break Through
YOUR
Production Barriers
Conforming Matrix Automatic Spray Finishing Machines, Electro-formed Masks, and Mechanical and Air Operated Fixtures permit production increases of hundreds to one over obsoleted hand methods.
Write for brochure or send prints or sample parts, giving production requirements and results desired.
Conforming Matrix
CORPORATION
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TOLEDO 11, OHIO
Telephone RA. 9-3777

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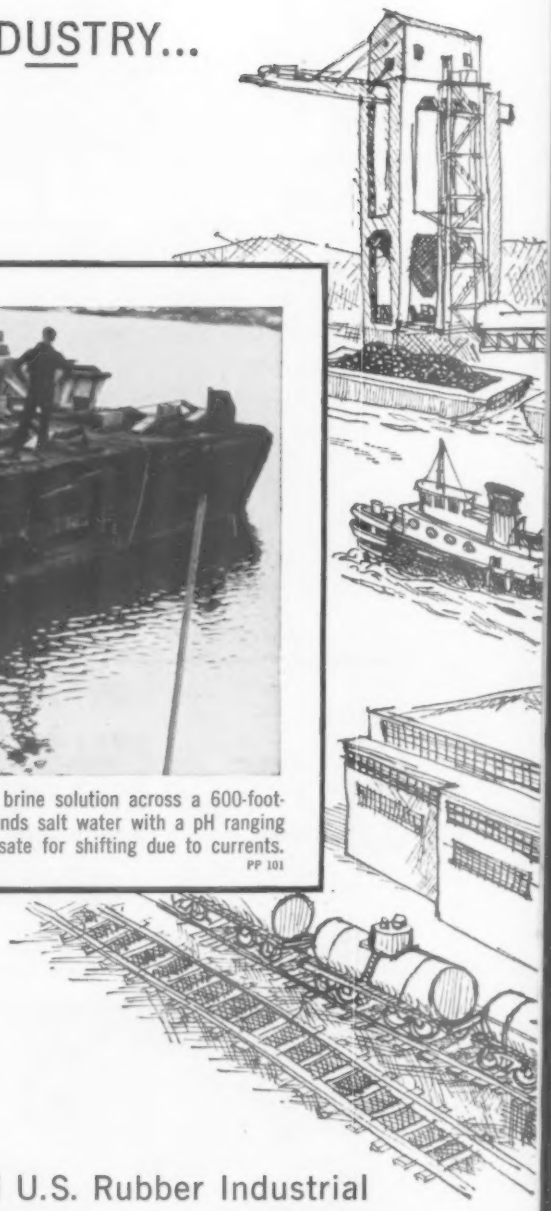
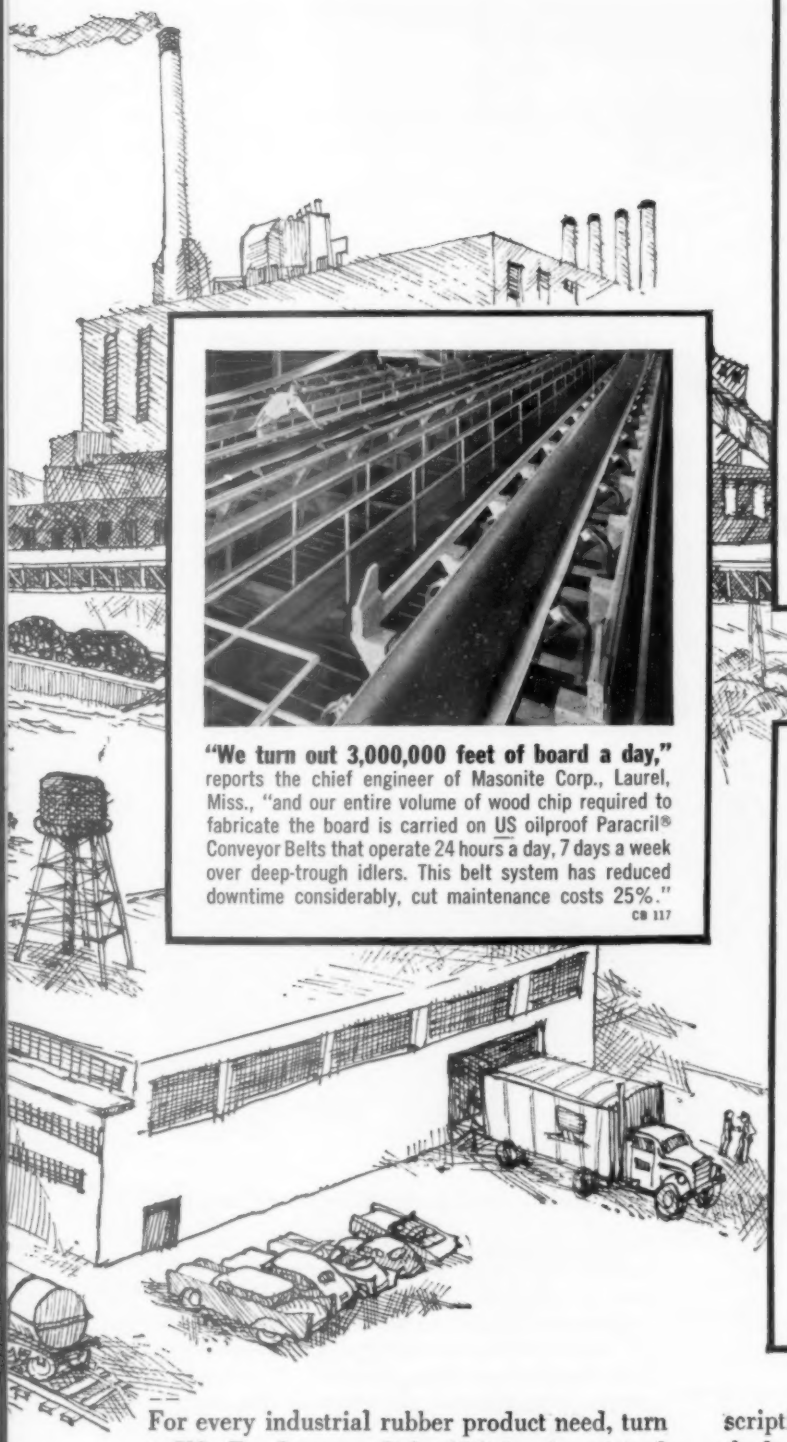
AT THE HEART OF INDUSTRY...

Underwater, underground, this U. S. Pilot® Pipe loves its salt diet—moves brine solution across a 600-foot-wide river economically and efficiently. Unlike metal pipe, U.S. Pilot Pipe withstands salt water with a pH ranging from 2.8 to 3.5, is flexible enough to follow the river bottom's contour, compensate for shifting due to currents.

PP 101



Wherever industry operates, you'll find U.S. Rubber Industrial Rubber Products helping it to function more efficiently...more profitably. As the world's largest producer of Industrial Rubber Products, US not only is aware of industry's requirements, but has the products to fill them.



Complete security—because this man's working next to the hose that death-causing steam cannot burst: U.S. Matchless® Steam. This hose has a built-in safety device. When it's ready for replacement, the wire-braid construction prevents it from bursting. Instead, just a wisp of steam seeps through, letting you know it's time for a new hose.

H 109

"We turn out 3,000,000 feet of board a day," reports the chief engineer of Masonite Corp., Laurel, Miss., "and our entire volume of wood chip required to fabricate the board is carried on US oilproof Paracril® Conveyor Belts that operate 24 hours a day, 7 days a week over deep-trough idlers. This belt system has reduced downtime considerably, cut maintenance costs 25%."

CB 117

Helping to create a revolution in wire-drawing, heavy-duty U.S. PowerGrip "Timing"® Belts are now used exclusively on machines made by the Whitacre Corporation of Los Angeles. Their positive, compact, maintenance-free driving power has enabled Whitacre to not only increase efficiency greatly, but to lower cost of the equipment at the same time. These belts are still operating after years of 24-hour-a-day service.

TB 101

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United States Rubber

MECHANICAL GOODS DIVISION

HUMAN RELATIONS

By Vivian Lunardi, Assistant Editor, FACTORY

Wage garnishments going up

The employee in the cartoon is getting a receipt instead of a pay check. His pay was garnisheed for debt. The Associated Industries of Cleveland reports fears that 1961 garnishments against employees may be four times the number of four years ago. It's a potentially serious problem for employers as well as employees. A recent Long Island Railroad survey concluded that it costs a company $20 to process the collection of each $100 of employee indebtedness.

Education of employees through company communications media can help reduce garnishments. These often result from the unethical sales practices that snare unsophisticated buyers. A few examples:

- *Balloon note* includes a series of small payments followed by a much larger final payment that the unsuspecting signer may be unable to meet.
- *Add-on contract* covers purchase of additional items before final payment on the original item. Eventual failure to meet a payment permits the seller to reclaim every item purchased under the continuing contract, even items already paid for.
- *Blank contract* emphasizes a small down payment but does not specify amount of time payments, which may turn out to be higher than the buyer can afford.

Another approach to minimizing the problem is to spell out company policy regarding employees subjected to garnishment. For example, many companies have established a policy of dismissal of employees after three garnishments.

Layoff aid plan gets award

General Electric Company received this year's Annual Achievement Award from the Council on Employee Benefits. Basis of the award is G-E's Income Extension Aid Plan set up in 1960 for employees who suffer layoffs for lack of work or plant closing. The plan provides cash benefits related to normal pay and length of service.

Are strikers loyal employees?

Employee gripes are not definite signs of disloyalty. In fact, kicking the management football around is part of the game—fun on the job. Few gripers would actually quit—they like their jobs. Pride of workmanship and good rapport with supervisors are the chief determinants of employee loyalty.

But this loyalty can be shaken by self-interest at contract time. Then blue-collar workers face about and go on strike—a seeming contradiction of their loyalty pattern.

Perhaps management is getting wise to this dualism in employee loyalty. More and more companies are serving coffee and sandwiches to strikebound employees. It's not a public relations gimmick, but a sincere effort to retain loyalty after the strike is over. This illuminating aspect of industrial relations was outlined by Edward Peters, labor conciliator of California, in a recent issue of *Personnel Journal*.

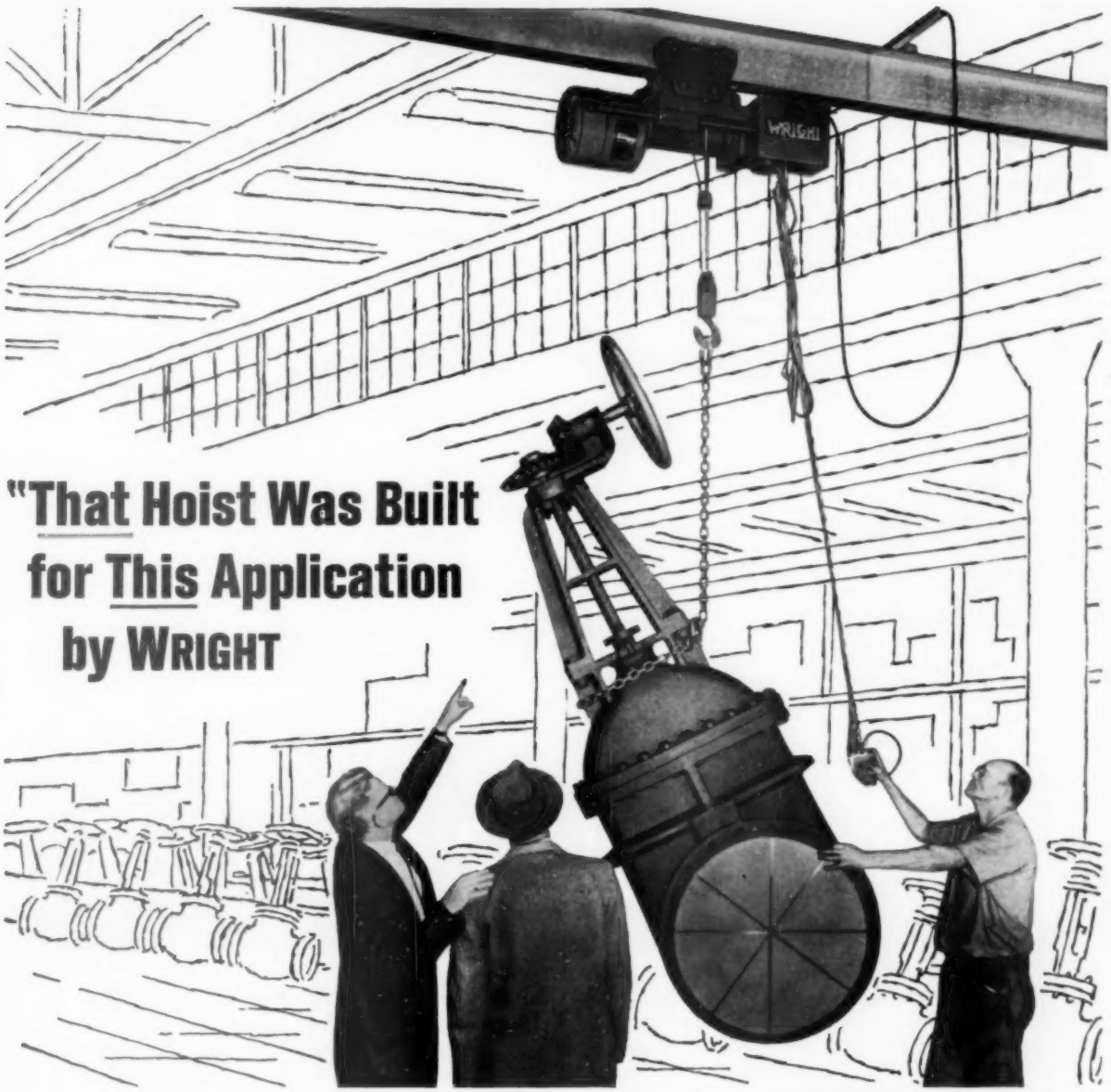
Drivers drive home quality

Employees of the main Buick plant of General Motors Corporation (Flint, Mich.) are brought closer to the need for product quality by test-driving the cars they help build. New cars, randomly selected, are loaned for a week to employees who sign up for the program. There's only one string attached. Each tester must report his experience with the car. The reports are passed on to all employees.

A union committeeman drew a car with a faulty transmission. An assembler had forgotten to tighten critical bolts. The car let the committeeman down on his first day out. Result? The assemblers received a lecture on quality—from the committeeman—such as they had never heard before.

Another employee took a one-week, 4300-mile honeymoon trip with nary a mishap to the car.

Turn the page



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This new W-1 Electric Hoist can be built to your exact job requirements. You can get it in capacities from 1 to 3 tons. For close headroom, ask for WH-1, in capacities 1 to 2 tons.

"Wright's overload cut-off can be had on both models. It gives you 3-way protection of operator, load and hoist. Our hoists are factory tested at 50% above rated capacity before overload cut-off is installed.

"These are the hoists to buy for handling efficiency, low maintenance cost, long service life."

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- **MOTORS**—Fully enclosed, ball bearing type. Built to NEMA specifications and rated on basis of 30-minute duty cycle.
- **BEARINGS**—Anti-friction, precision ball or roller bearings support both ends of all shafts. They are mounted in splash oil lubricated gear chamber.
- **MOTOR BRAKE**—External expanding jaw, self-adjusting cam type; operated by solenoid.
- **DRUM**—Fabricated all-steel construction with liberal drum to cable diameter ratio to reduce wear and cable fatigue.

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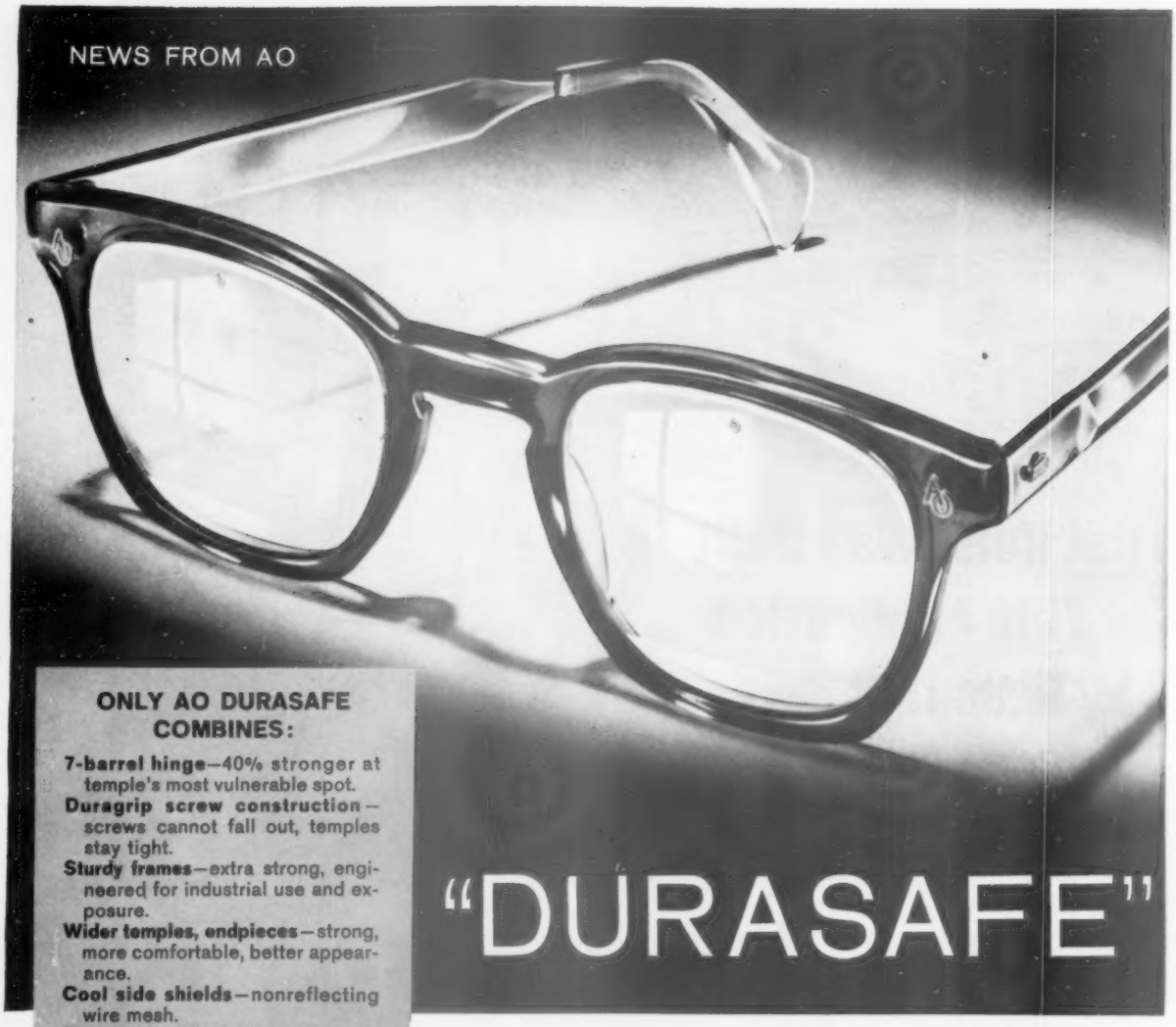

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...the glasses workers wear willingly

Your plant eye protection program's *full* effectiveness is governed by the workers' willingness to wear safety glasses (or goggles) regularly. In the new Durasafe, you have fitting qualities and a choice of colors and combinations that satisfy everyone . . . combined with the latest safety features that mean maximum protection and durability.

This wearer acceptance can be a big factor in preventing costly eye injuries. For the new Durasafe will protect against 80% of the eye hazards in an average industrial plant with a full eye protection program.* For full information on the glasses workers *want and will wear*, call your AO Safety Products Representative, or write for Bulletin S-1013.

*Other types of AO safety goggles are needed to cover special hazards.

ONLY AO DURASAFE COMBINES:

7-barrel hinge—40% stronger at temple's most vulnerable spot.
Duragrip screw construction—screws cannot fall out, temples stay tight.
Sturdy frames—extra strong, engineered for industrial use and exposure.
Wider temples, endpieces—strong, more comfortable, better appearance.
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Easy to identify—AO monogram on frames and lenses identifies Durasafe at a glance.

TAKE YOUR CHOICE OF

Solid colors
Smoke (F9800SM)
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Mahogany on Crystal (F9800MC)
Black on Crystal (F9800BC)
Temples
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Aluminum with plastic tip
Full range, bridge & eye sizes
Safety Rx or plano lenses
With or without side shields

Your Surest Protection . . . AO SURE-GUARD Glasses

American Optical COMPANY

SAFETY PRODUCTS DIVISION • SOUTHBRIDGE, MASSACHUSETTS

For more facts Circle 496 on Reader Service Card

Begins on page 170

HUMAN RELATIONS

Plants go cultural

Plant executives of the A. O. Smith Corporation, Granite City, Ill., are taking an in-plant, college-level course in creative literature. Plant executives of the Union Starch Company, Granite City, recently completed an in-plant course in logic. Southern Illinois University, Edwardsville, Ill., is providing instructors and material for these job-unrelated courses.

For many years now, Southern Illinois and other universities and colleges have put on in-plant, college-level courses for plant management personnel during work hours. But these courses have been job-related—management and technology courses designed to help plant executives perform their jobs better. The purpose of the new courses, unrelated to the students' work, is purely cultural.

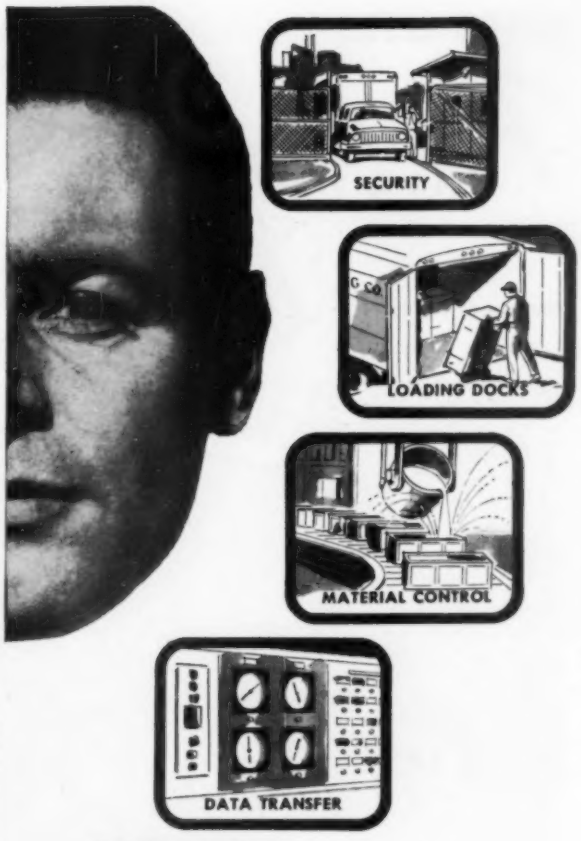
The courses are given in 12 two-hour weekly sessions. A. O. Smith's class meetings in creative literature, for instance, are held every Wednesday, 3 to 5 p.m. They cover important works of fiction, drama, and poetry. Union Starch's course in logic includes verbal pitfalls, levels of meaning, emotive language, and kinds of argument.

Ford boosts community service

Six Detroit-area Ford Motor Company employees received "Citizen of the Year" awards for outstanding voluntary community service. This program is carried out in 51 Ford plant cities throughout the country.

The community service awards program is open to all company employees except those directly connected with its administration. Considerations include the amount of personal effort contributed to the community, result of the service, degree of selflessness and sincerity of motivation, extent of personal sacrifice, and originality of the service.

Appointed local management committees judge the nominations. Employees deserving of special recognition receive a desk plaque with an engraved commendation by Henry Ford II. "Ford Citizen of the Year" is the citation for those who merit distinctive recognition. They receive a cast bronze town crier's bell bearing an engraved figure of a town crier and the winner's name. Of the 600 nominated



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has proven invaluable in relieving the difficult and awkward in-person monitoring of many plant operations . . . material flow on conveyors . . . bin levels . . . loading dock traffic . . . gate traffic . . . gauge watching. In addition, closed circuit TV can be used in employee instruction and plant communications. Highly developed, fully transistorized equipment featuring Philco's "building-block" design assures ease of operation, freedom from maintenance and permits future expansion without costly replacement. Write today for your copy of the Philco Closed Circuit TV System Planning Guide.

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the true door . . . not a curtain. Doors?

A Rubbair Door installation at the warehouse of S. Kann & Sons Company, Hyattsville, Maryland

THE S. KANN SONS CO.
Washington, D. C.

READ THIS ACTUAL CASE HISTORY . . .

In response to your letter of March 25, we are happy to inform you that we are very pleased with the Rubbair Doors that were installed about 3 years ago in our warehouse at 5620 Ager Rd., W. Hyattsville, Md. They have held up well and have satisfactorily performed their function of keeping cold air out of the building while allowing easy passage of merchandise through the doorways. If we were to build a new warehouse, we would duplicate the Rubbair door installation.

Sincerely yours,
B. B. Bergunder, Jr.
Vice President

RUBBAIR DOORS flex on impact because of their construction. They absorb high traffic punishment from the constant pounding of fork trucks, material handling equipment, packing boxes and cases. The 'flex' and 'bounce' features of RUBBAIR DOORS give you longer, factory-tested door life and extremely low maintenance costs.

RUBBAIR DOORS assure trouble free operation with . . .

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- **Rugged V-Cam Hinges**
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If you have an industrial or warehouse door problem, let us help you solve it. Write us about it, or send for free catalog.

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174 **For more facts Circle 498 on Reader Service Card**

Begins on page 170

this year, 99 received community service plaques and six of these were honored with the Citizen of the Year awards.

Types of service recognized range from Little League baseball to operation of a low-cost training school for sewing operators, the modest profits of which go to summer programs for deserving children.

Movies with munching

There are no Bugs Bunny cartoons or popcorn venders in this theatre. But the free movies offered the night-shift workers of the General Motors Corporation plant in Oshawa, Ont., aid relaxation during their half-hour lunch periods.

The movie fare is mixed. Vacation movies made by plant employees are popular attractions. Others include entertainment movies and serious presentations on safety, all provided by the company.

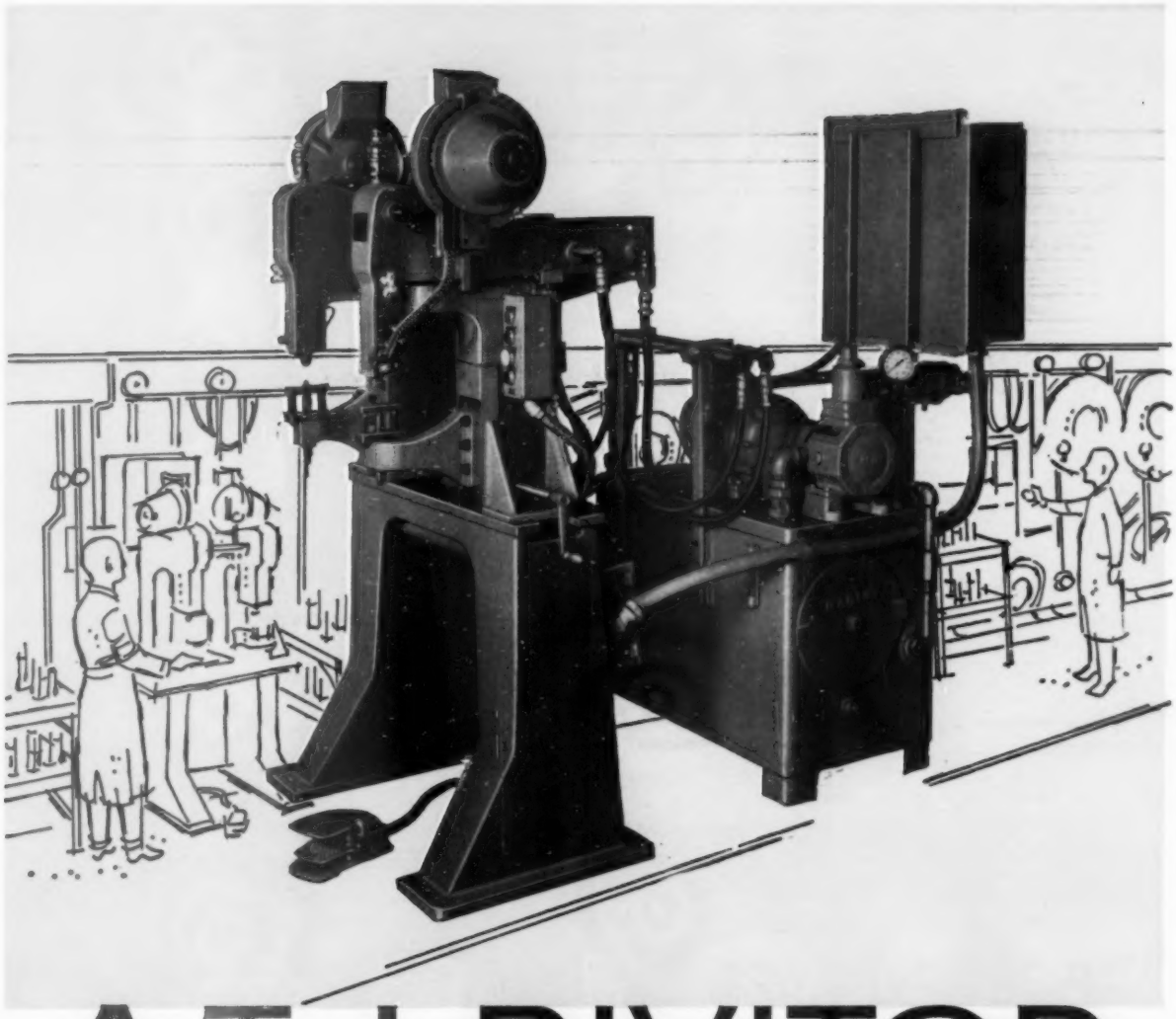
Private limousine for 40

What do you do when plant relocation leaves employees stranded without transportation? If they are as enterprising as the 40 at Norden division of United Aircraft Corporation, management needn't be concerned. When the plant moved to Norwalk (Conn.) a group living in the Milford area chartered a bus.

Now the bus appears at the plant door each day at 7:50 a.m. and 4:45 p.m. According to "wagonmaster" Mary Thompson who collects fares, there's no standing room, but there is a waiting list.

Portal-to-portal safety

The Kordite Company, Macedon, N. Y., offers its employees a special price on auto seat belts to boost highway safety. The personnel department of this division of National Distillers and Chemical Corporation sells the belts to all employees who ask for them. The price is wholesale cost, less a 25% contribution by the company. Also, the company has made arrangements with nearby garages to install the safety belts during employees' work hours.



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on your production line means higher production rate . . . lower unit cost!

T-J Rivitors and Clinchors are designed, engineered and manufactured to conform and operate efficiently on today's high-speed production lines. For whatever your product . . . if it demands a fastening assembly procedure . . . a T-J riveting or clinching machine adds to its high quality standards by their ability in providing long, rugged service-free life.

Many standard designs to choose from . . . or a T-J can be custom designed for your exact requirements. Write Tomkins-Johnson, 2425 W. Michigan Ave., Jackson, Mich., today. Ask for Rivitor and Clinchor Bulletin No. 646 or Clinchor Bulletin No. 555.

RIVITORS

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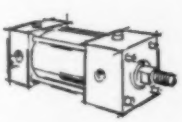

CYLINDERS

CUTTING TOOLS

T-J TOMKINS-JOHNSON
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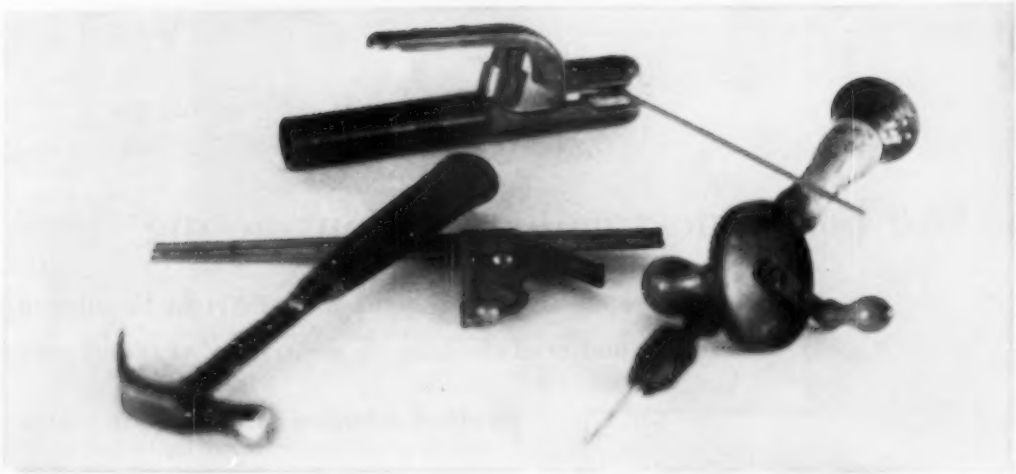

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There's no figuring and finagling to fit pieces. Slots and holes, in a precise recurring pattern, line up with flawless accuracy. You needn't tie-up skilled personnel. Regular labor can master this complication-free assembly in minutes. And steel or aluminum AIM Brand Slotted Angle carries its load for keeps. The perfect-fit connections won't budge, buckle, wrack or crack.

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As an added convenience, over 200 popular types and sizes of structures are now available pre-cut, ready-to-assemble. Your local AIM Brand distributor has all the facts and figures. Or, send for your free copy of the new fully illustrated idea booklet, "Creative Framing at Lowest Cost." Write: Acme Steel Company, Dept. Fac-71, 135th St. & Perry Ave., Chicago 27.

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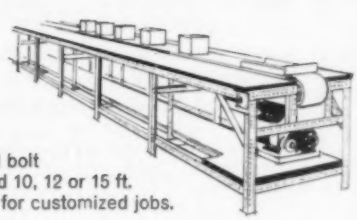
FRAMING · STRAPPING · STITCHING

Slotted Angle Kits offer new convenience and economy in pre-cut form.



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For more facts Circle 500 on Reader Service Card

LABOR RELATIONS NEWS

By Paul Ruig Member, New York Bar

The boar's nest called subcontracting

The box score on upholding management's right to subcontract is hard to keep. It's not just a simple matter of chalking up arbitrators' yeas and nays.

NEWS TIPS

• If you don't want your female employees bidding for "male-held" jobs, better insert language in the contract to that effect. Arbitrator Harry Abrahams told Blocksom and Company, Michigan City, that different pay rates for the sexes in its other plant jobs didn't preclude women from bidding for jobs that were assigned a male rate only.

• Recent technological and industrial changes in the economy mean new jobs—new job descriptions. Keeping pace with these changes, the U. S. Bureau of Employment Security has just issued a brochure entitled "Technical Occupations in Research Design and Development," listing and describing 65 new technical occupations. (Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C.; 50 cents per copy.)

• A full day's work for a full day's pay is not too much to expect—but we don't always get it. Bad communications may be the reason, E. F. Foubert, Vice President of Rockwell Manufacturing Company, told a conference of the National Association of Manufacturers. He referred to a survey of 50 company presidents—48 of whom concluded there was a "definite relationship between productivity and the communications effort." In another survey—of plant executives—consensus was that efficiency would increase at least an average of 20% if management made a concerted effort to communicate the need for a full day's work for a full day's pay.

In a recent arbitration award, good faith was the determining factor. And in a case brought before the National Labor Relations Board, contracting out the entire unit made the difference. Management won in both instances, but victory may be shortlived if the United Auto Workers gets its way.

Part of the business of West Virginia Pulp and Paper was on the skids. At least, that's how its product was shipped out—on skids and pallets. The practice had been to make these in the plant. The union raged and ranted when the company contracted out their manufacture. Management was accused of trying to undermine the union. Nothing of the sort, responded the company, economy is the reason. To the union this was bunk. It said management's comparison of make-or-buy costs was inaccurate. The outside product was made of cheaper materials and was assembled differently. Management's real motive, the union held, was to get rid of the union.

Arbitrator Benjamin C. Roberts heard both sides and set down this method of analyzing a subcontracting case:

(1) Does the contract *by its terms* restrain the company from contracting out the particular work?

(2) If not, was the subcontracting done in good faith, or was it intended, under the pretext of economy, to subvert the contract and discriminate against union employees?

On item one, Roberts cited this clause from the contract: "The company reserves the rights, powers, and authority customarily exercised by management subject only to the express provisions of this agreement." He was unable to find any pertinent "express provisions" in the contract. And he shoved aside as irrelevant the union's argument that the recognition, job security, seniority, layoff, and wage clauses curtailed management's power to subcontract.

As for item two, Roberts found the company had acted in good faith, despite its decision to subcontract after a strike had been settled: "Concededly, the skids and pallets that were bought were made of cheaper material and construction, and no effort was made to duplicate this in the box shop before concluding that it was more economical to buy them. The financial figures submitted by the company were not based on comparable construction, and admittedly did not include every item of cost that might be allocated to the purchased skids. The company made its determination based upon inadequate comparisons, *but not in bad faith.* So the decision could not be said to have been made in violation of the non-discrimination provisions of the contract. Errors in judgment are not an indication of a lack of good faith. Moreover, it cannot be said that the company was under any duty to attempt to duplicate the purchased skids internally before making its final decision."

Now let's examine the NLRB case. A survey made by the Fibreboard Paper Products Corporation indicated a saving of about $225,000 a year if maintenance work were subcontracted.

Turn the page

NEW CASE

New lightweight plastic case won't rot, rust, warp or split. Impervious to most acids and caustics. Water resistant. Mechanically tough and rugged. Interlocking lid and bottom. Modern, red, smartly styled. Ample room for extra canisters. Weighs only 3 pounds.

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New unique nylon harness and molded plastic canister holder give wearer maximum flexibility. Injection molded nylon shell slides over canister top. Easily adjustable nylon webbing permits one harness for *all sizes of MSA canisters.* Reduces inventory. Resists acid, water, mildew. Easy to clean. Dries fast.

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New *seamless* oval canister eliminates potential leaks inherent in canisters with soldered side and top seams. Smooth. Streamlined. Threaded canister neck permits easy assembly and disassembling of canister from breathing tube. High efficiency toxic dust filter in all canisters extends protection to include particulate contaminants.

NEW FACEPIECE

New Clearvue Facepiece permits full, unobstructed vision. Exhalation baffle cuts lens fogging. Lens retaining device eliminates pop-out, loosening, leakage. Easily accommodates corrective spectacles. Equipped with speaking diaphragm. No special tools needed for easy lens replacement in the field.

An all-new gas mask line from MSA

We invite you to compare these striking new design departures with any other gas mask line in the world.

These features of the future are available right now, exclusive with MSA. Only MSA offers a complete line of gas masks, *all* approved under the *latest* Bureau of Mines Schedule 14F.

The new MSA line with interchangeable canisters includes these models: Industrial, All-Service, and Tank Gauger's or Super-Size. See how this new look ahead in gas masks increases worker safety, comfort, efficiency, extends service life, simplifies maintenance.

For a feature by feature demonstration of all these new design details, contact the MSA representative. And for helpful bulletin write Mine Safety Appliances Company, Pittsburgh 8, Pennsylvania.

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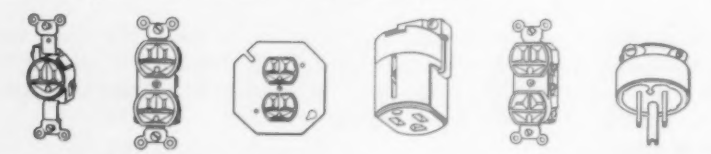
G-E Grounding Outlets simplify work for maintenance men

1. Look — two 20A branch circuits with the flick of a screwdriver. You just remove breakoffs in this GE4108 Specification Grade Grounding Outlet, to get two circuits from a 3-wire, 120/240V service or from separate 120V circuits. Outlet accepts four types of caps, too.

2. You get eight back-wiring holes, with pressure-clamp terminals for Nos. 14, 12 or 10 Awg wires — plus four side wiring screws — two grounding screws.

3. Sturdy Construction, with double wipe contacts; "through" strap; captive mounting screws. 20A, 125V; U.L.-listed; meets Federal and REA specifications.

Get the "maintenance man's line" of grounding outlets and other wiring devices! Call your G-E distributor. General Electric Company, Wiring Device Department, Providence 7, Rhode Island.



15A; 125V, 250V | 15A; 125V, 250V, 277V 20A; 125V | 15A; 125V, 250V | 15A; 125V, 250V | 15A; 125/250V | 15A; 125V, 250V, 277V 20A; 125V

Progress Is Our Most Important Product

GENERAL ELECTRIC

Begins on page 178

LABOR RELATIONS

The catch was that the whole unit consisted of maintenance men. This meant the end of the union. Asked to bargain on a new contract for the unit, the company said no, the unit no longer existed. But the company was willing to discuss termination and vacation pay.

This is a refusal to bargain, responded the union, and the matter went before an NLRB trial examiner. He ruled that the company had the power to contract out the maintenance work for economic reasons. There was no unit to bargain about. But he made this important distinction: If only a *part* of the unit work is subcontracted, then the unit remains, the contract remains, and there is something to bargain about with the union.

Two victories for management! And there have been many more—to such an extent that the UAW recently agreed at its collective bargaining planning conference to demand tighter restrictions on contracting out. Chief targets: subcontracting of maintenance work and of parts and components.

Phantom clauses

When does a past practice become a part of the union contract? You can't find a clear thread of consistency in the arbitration awards.

Arbitration awards on past practice run all over the lot. But there's a legal way to prevent past practice from jelling into a contract provision —if you want to go to the trouble. But first, here are two cases on opposite ends of the stick:

For 17 years, a group of Goodyear Tire and Rubber employees took 30 minutes to wash up at the end of the day—a practice that just grew up. It was taken for granted. It's frozen in the contract, ruled Arbitrator Charles C. Killingworth. It will take negotiation to reduce it to 20 minutes.

Now hear this case: For 18 years, production employees of Magnavox had taken coffee and coke back to their machines, where they drank while they worked. Then the company posted a rule limiting the use of vending machines to lunch and

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Stronger construction—Neater appearance—Easier to assemble

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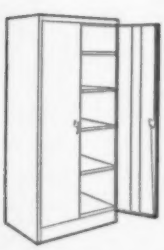
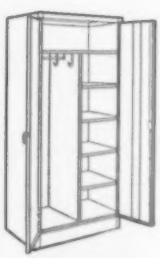
**Meet Federal Specification AA-C-31a*



MODEL 815
Storage cabinet with double door and 4 adjustable shelves.

MODEL 835
Wardrobe cabinet with double door . . . holds 12 to 16 heavy coats.



MODEL 855
Combination cabinet with double door . . . wardrobe and 4 shelves.

SIZES: 36″ wide, 78″ high, 18″ and 24″ deep.

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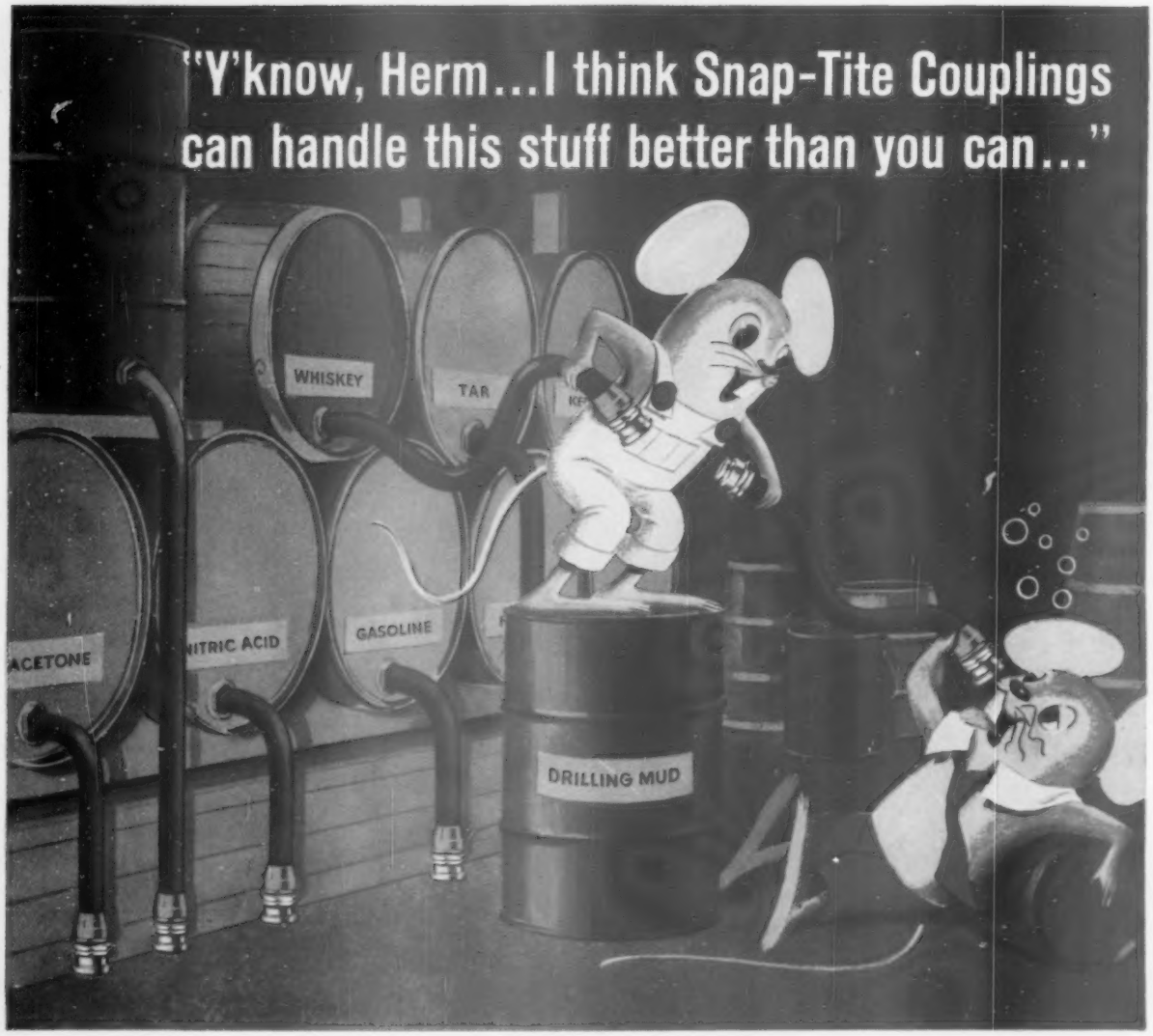
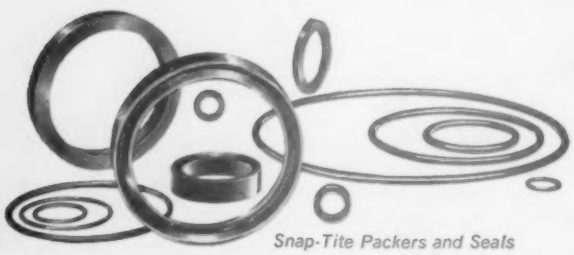


A complete choice of packers and seals permits Snap-Tite quick-disconnect couplings to handle over 600 different fluids! *(some of them mighty tough)*

Whatever fluid you're working with, chances are Snap-Tite couplings can handle it. Because every-one of the thousands of Snap-Tite quick-connect valved couplings comes with a wide choice of rubber packers and seals, selected according to the fluid in use. The right choice, of course, is vital for the seal is the very heart of the coupling.

To assist you in the proper selection of coupling seal material, Snap-Tite, with the assistance of suppliers of synthetic rubber materials, has recently compiled a comprehensive Packer Usage Guide —the first of its kind in the industry.

For the Packer Usage Guide, and for complete information on the correct choice of quick-connect, quick-disconnect couplings for the fluids *you* use, write Snap-Tite, Inc., Union City, Pa.



Snap-Tite Packers and Seals

ST-61-02

Snap-tite

UNION CITY, PA.

K-8120

Begins on page 178

contract-specified periods, which effectively restricted beverage consumption at work. Okay, ruled Arbitrator John Day Larkin, despite the fact that about a year before the rule was posted, Magnavox had unsuccessfully tried to negotiate a change in the rule for inclusion in the contract. Larkin commented: "Regardless of past practice, or oral discussions covering the use and/or abuse of vending machines, the company has not agreed in writing to permit free and unrestricted use of vending machines." His second point: "It may be true that, after permitting the free use of the machines for some 18 years, the withdrawal of such privileges may have the effect of disrupting the morale of those against whom the action is taken; but that is a risk the management may take if it chooses . . ."

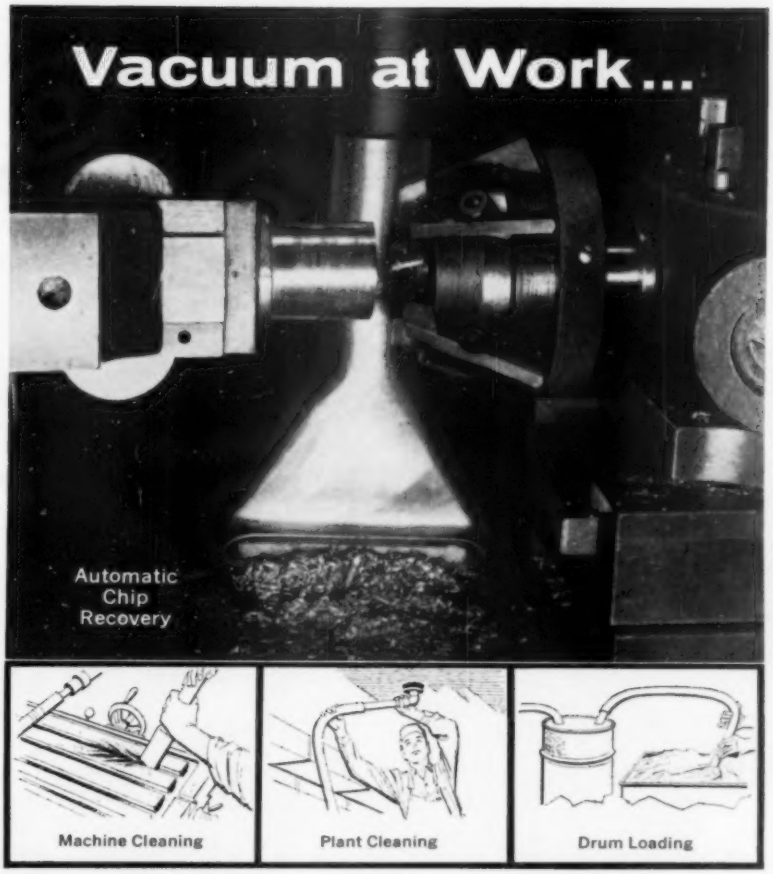
To avoid phantom clauses—past practices that become frozen into the contract—a good starting point is a clause in the contract reserving the right of management to make unilateral changes in specified areas. But it may be too late to change the contract. Second line of defense is to watch carefully practices and procedures that spring up and which are not sanctioned by the contract. Either insist upon strict contract compliance or—if an exception must be made—post notices promptly indicating that an exception is being made and that management reserves the right to insist upon strict compliance at any time. Send a copy of the notice to the union office. The third line of defense is to do nothing—and hope that you can pick an arbitrator who will rule your way.

Temporary transfers

The job carries the lower rate in some cases.

The clause read something like this: "Management can transfer an employee to another classification temporarily if no work is available or scheduled in his regular classification, and his pay shall be that of the temporary job."

A grinding machine operator was transferred to material handling—a lower-paying job—because if he



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Flexible Invincible vacuum equipment recovers, reclaims, processes, conveys. It will handle metals, liquids, lint, gases—virtually anything that can be passed through a vacuum line.

Vacuum created by Invincible units may be brought to the point of application on wheels or through pipe. Portable machines can be taken off production work during off periods and used as vacuum cleaners, thereby controlling health, fire and explosion hazards.

Capable of continuous operation, rugged Invincible equipment has solved hundreds of production problems, reduced costs and simplified the design of automatic machinery. Over 150,000 Invincibles are currently in use . . . 5,000 are in their 35th year of service.

There are 28 different standard Invincible models, plus special machines and other combinations, ranging from ½ to 10 H.P. More than 50 years of experience in vacuum application are available. Resident engineers in principal cities. Accurate free surveys can be made on short notice.

Write us for detailed information concerning *your* problems.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

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Begins on page 178

continued on his regular job there wouldn't have been enough work for senior grinders on earlier shifts. The union plugged for the higher grinding rate.

The arbitrator disagreed. Nothing in the contract called for anything other than the material handling rate. Further, the employee had no choice about it. He had to take the lower-rated job on a temporary basis.

The nagging steward

Stewards are expected to nag management—complain about plant inequities. But when the bulk of their nagging is for special treatment for number one, they can be fired like any other employee who is an habitual nuisance.

Plant prima donnas are trouble enough. But when one happens to be a highly competent worker and a union steward to boot, management may be in for a double dose of trouble.

This steward, with advance degrees in prima donnaship, was fired on the ground that he was an habitual nuisance. The way the law stacks up at the present time, if his complaining was on behalf of other employees, his discharge was an unfair labor practice. But if what he nagged about was on his own behalf, for the most part, he was an ordinary nuisance and could be fired. The trouble was that the NLRB and the U.S. Court of Appeals didn't see eye to eye on the evidence.

Since the nuisance was over a long period of time, we needn't take the space to describe it fully. But you can get the picture from this brief rundown: When this steward couldn't get along with the night supervisor, they shifted him to day work. Then they put him back on the night shift because he was needed at home during the day. They put him to work on jobs that produced more in hourly wages than was earned by others in the plant with better jobs than his. But, like a nagging wife, nothing would satisfy him. The straw that broke the camel's back was when this employee bellyached that during a time of slack work

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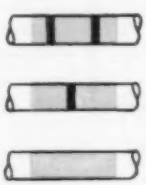
These are the codes which use yellow tapes. For a complete list of colors and their suggested codes write us.



MINNESOTA MINING AND MANUFACTURING COMPANY

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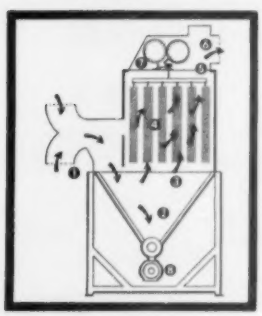

AUTOMATIC AND EFFICIENT, the filtering cycle of each TORIT section is self-timing. A separate blower on the clean air side keeps collector under suction. Then, (1) dust-laden air is taken into manifold; (2) coarse dust drops out; (3) fine dust is carried to filtering sections; (4) filter tubes catch dust on inside surfaces; (5) clean air emerges from filters; (6) to suction fan and clean air discharge outlet. (7) *Automatic* shaking and reverse air filter cleaning mechanism. (8) Conveyor *automatically* removes and discharges accumulated dust.

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TORIT MANUFACTURING COMPANY

Automatic Collector Division, 1133 Rankin St., St. Paul 16, Minn., Dept. 334

Begins on page 178

some other employee with less seniority was put on the job instead of himself. Then the company lowered the boom and fired him.

The NLRB said he was unfairly discharged. He had been fired for complaints made on behalf of his co-workers. But the federal appeals court looked at the very same evidence and concluded he was fired for being an habitual nuisance on his own account. Management could fire a worker for that reason—even if he also happened to be a union steward.

Absenteeism

When an employee is on the carpet for excessive absenteeism, improvement is not enough reason to upset his discharge.

After several warnings about his excessive absenteeism, this employee was fired. He argued that he had improved. But the arbitrator wasn't taken in. The improvement by itself was meaningless in view of the employee's poor attendance record. This employer made out all right in arbitration, but to be certain, you should warn employees being disciplined for excessive absenteeism that you expect not improvement—but near perfection.

Call-in pay

Take a look at all the circumstances before you conclude that call-in payments are not called for, advises Arbitrator Thomas Kennedy.

Even the toughest-minded union will concede that fires, hurricanes, and ice storms are beyond the control of management and that, under such circumstances, call-in pay is not warranted. But suppose the work comes to a stop because of a machine failure or, as in this case, a clogged-up duct?

Arbitrator Kennedy analyzed it this way: Under typical call-in provisions, management is absolved from making payments if the breakdown was beyond its control. To Kennedy, and probably other arbitrators too, this means a condition that management cannot reasonably

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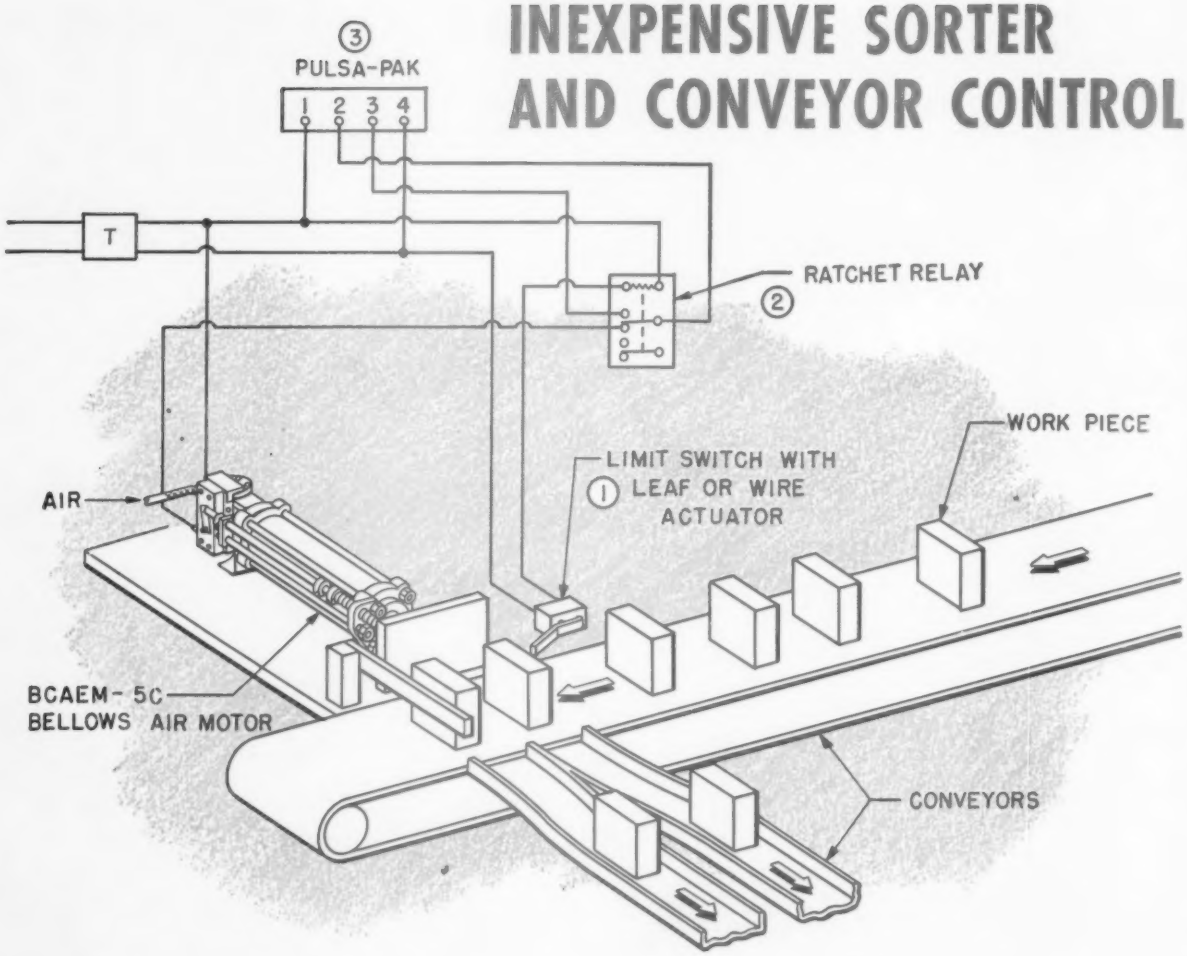

Here is a simple idea developed originally by a Bellows-Valvair user to feed back to two different points—but the basic idea can be readily adapted to many uses—for example, to feed parts to two separate assembly lines.

As the first part moves down the conveyor it trips limit switch (1) which causes the ratchet relay (2) to shift position and charge the capacitor in the Bellows Pulsa-Pak®. The first part moves on against the positive stop where it holds. The second part trips the limit switch (1) to shift the contacts of the ratchet relay (2) to the position shown, and to release a momentary electrical impulse from the Pulsa-Pak which causes the electrically-controlled, adjustable stroke Bellows Air Motor® to advance, feeding the two parts to the separate conveyors. The Air Motor automatically retracts and the cycle continues.

This is only typical of the many ways Bellows Air Motors are used to control the distribution of parts in conveyor operations. Distribution by size, shape or weight of parts to separate outlets is readily accomplished with Bellows Air Motors and their available controls. Your local Bellows-Valvair Field Engineer will be happy to work with you in applying these ingenious pneumatic devices to your operations.

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Contains installation data, wiring diagrams, detailed descriptions of basic ideas you can adapt to your operations. Write for it today. Address Dept. FA-761 Bellows-Valvair, Akron 9, Ohio.

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Bellows-Valvair

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DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

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FACTORY

Begins on page 178

be expected to foresee and prevent. In such cases, look at all the facts, advises Kennedy. Management, in the case of the clogged duct, couldn't have foreseen what actually happened. It had never happened before—not in many long years of operation. No call-in pay here, he said.

Death in the family

To avoid automatic three-day pay-offs, interpret death-in-family clauses cautiously, this arbitrator warns.

One of the "heart" clauses in the union contract is the time-off-with-pay-for-death-in-the-family provision. Management would like to see a flexible clause that can be adjusted to account for the many situations that might come up—some of which may require an employee to take off as many as five days or as few as one day. But unions want a flat rule—to avoid discrimination—and as long as there is a rule, Arbitrator John R. Ebersold said, in effect, that it must be administered carefully. Otherwise the "flood gates would be wide open for excuses of all sorts—which the ingenuity of man would not find difficult to conceive."

The clause that led to his observation provided up to a maximum of three days' pay for time lost solely because of the death or funeral of a parent. The facts that gave rise to the grievance were: The employee's father died on Thursday, was buried on Saturday. The employee claimed pay for his absence on Monday, pointing out that he had to drive his sister to a distant city so she could get home on a good flight. Sure, he came back at 11 a.m. on Monday—but then he had to fix a flat for a cousin who had attended the funeral. Said Ebersold: "If the arbitrator upheld his absence, it would be difficult to imagine how in the future the company could avoid paying three days' pay automatically for death in the family."

(Items in this section are developed from full citations published by the Bureau of National Affairs, Inc., Washington, D.C., and from other sources.)

No. 9 in a series of washroom survey comments from "SBS soap counselors"

We showed them how to cut washroom housekeeping costs!

Edward P. Goeres

is a SBS soap counselor in the Midwest. A specialist in industrial soaps, he has helped many plants reduce their wash-up, clean-up costs. Here's the result of a typical survey:

"We found washroom clean-up costs exorbitant because this plant was using slow-acting scrub soaps, scouring powder and disinfectants. These single-purpose products required lots of elbow grease and wasteful duplication of labor.

"We naturally recommended SBS 50. We let them see for themselves how effectively this one product, SBS 50, ***cleans, disinfects, sanitizes*** and ***deodorizes*** in just ***one operation*** . . . without wasting either labor or material! We also stressed SBS 50's exclusive *4-Way Action* that kills germs on fixtures, floors and walls . . . and leaves an invisible "Bacteria Barrier" on sanitized surfaces that gives continuous protection."

Money-saving suggestions like this ***begin*** with OPERATION PINPOINT–a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

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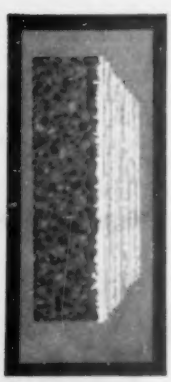

3. No more bills for water damage. Because these products are cement-based, both Waterplug and Thoroseal bond compatibly with all masonry and concrete. They actually become part of the wall—and last just as long! Designed for use above grade or below, indoors or out.

• Ask for free specification guide to all 21 time-saving, money-saving products of The Thoro System. Insure long-lived top performance in waterproofing, renovating and decorating masonry and concrete.

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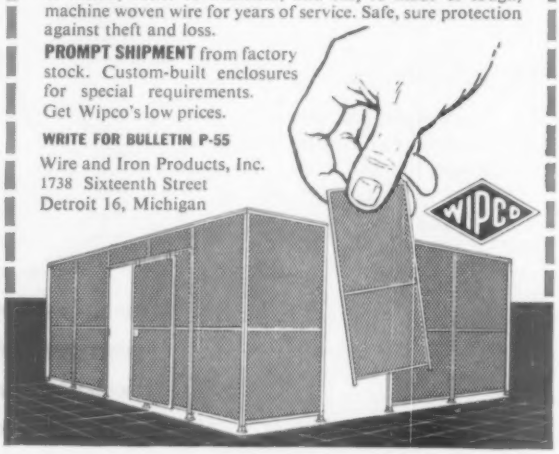

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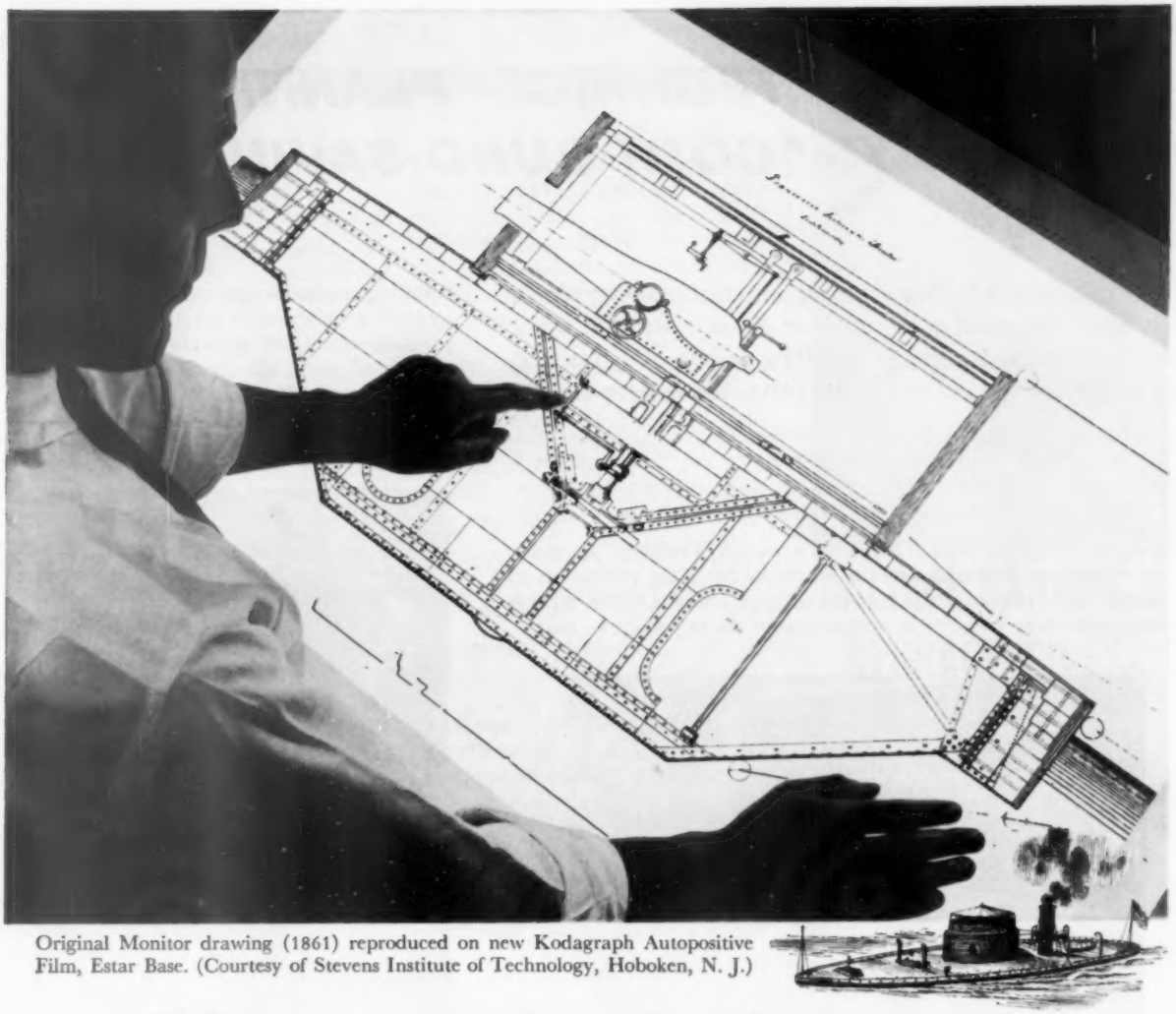

Original Monitor drawing (1861) reproduced on new Kodagraph Autopositive Film, Estar Base. (Courtesy of Stevens Institute of Technology, Hoboken, N. J.)

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New Kodagraph Autopositive Film, Estar Base, gives you intermediates that are as tough as they come and have exceptionally sharp detail.

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See this versatile new Kodagraph Film—and the others in the new *Estar Base line:* Kodagraph Contact Film; Kodagraph Projection Film.

All combine reliable Kodak emulsions on the new Estar Base—highly translucent, durable, and dimensionally stable, with excellent matte surface on both sides for easy drafting. Available in standard drawing sheet sizes and in rolls up to 52 inches wide. Call your local Kodagraph Dealer, or write Eastman Kodak Company, Graphic Reproduction Division, Rochester 4, N. Y.

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RAPISTAN Ideas HANDLING

HOW "TECHNICS" PLANNING PAYS "COMPOUND SAVINGS"

In any business, whether yours is a manufacturing plant, a wholesale warehouse, a retail or chain operation, or a service industry, materials handling is the one function that is closely related to all the other management arts.

Because of its influence on so many other departments and functions, it can be utilized as a management tool, to coordinate methods improvements throughout an organization, directed toward the common goal of reduced operating costs and increased profits.

This principle is the basis of Rapistan's proven "Technics" approach to cost reduction. It starts with the materials handling system, in all its aspects; then, extends the benefits of improved materials flow to produce subsidiary benefits in other areas of management as well.

New containerization of these conveyor wheels, specified by Purchasing, coupled with a new automatic unloading device designed by Plant Engineering, speeded truck unloading to 1/12th the former time. Wire-bound crates are designed for re-use as finished goods shipping containers for a further saving.

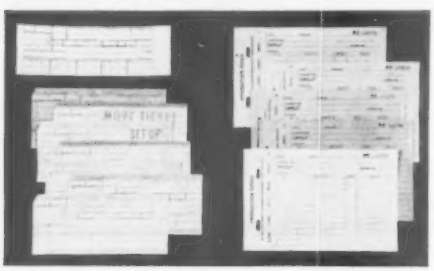
Thorough Planning—The Key

Rapistan's "Technics" concept of materials handling goes an important step beyond solving the problems of movement, transfer, storage and flow control. It recognizes the inter-relationships of the flow system with other management functions—purchasing, industrial engineering, product design, manufacturing, quality control—even clerical procedures.

By thorough planning, to augment and capitalize on improvements in the flow system through all related management activities, a "Technics" plan gives management maximum return on its investment.

A successful Technics program requires skillful coordination, under centralized and authoritative direction. Only top management can provide this. But, by the nature of his specialization, the materials handling engineer can contribute much to such a program. Your Rapistan sales engineer can offer new ideas and techniques of materials handling. And, his knowledge of "Technics" principles can help you compound the savings in many related phases of your total operation.

Plant engineers who designed this transfer mechanism to match Rapistan live storage Flow Racks helped make the entire system more efficient and versatile. Such contributions illustrate relationship between plant functions and materials handling, developed through Technics planning.



IBM data processing is coordinated with the flow system in this successful Technics program. These cards trigger movement of raw materials and work in process into and out of storage, and over the conveyor system between manufacturing operations.

The success of Rapistan's Technics approach to management of materials flow has been documented by over 70 pages of editorial comment in leading business and management publications. For your copy of this illustrated case study, write to The RAPIDS-STANDARD CO., Inc., 545 Rapistan Bldg., Grand Rapids 2, Michigan.

Rapistan®
CONVEYING EQUIPMENT

For more facts Circle 516 on Reader Service Card

CATALOG NEWS

For more data, circle item numbers on Reader Service Card next to back cover.

PRODUCTION

1—Shop tools. Comprehensive new catalog (No. 700, 132 pages) describes complete line of tool holders and bits, wrench and socket sets, many other manual tools. Includes 330 items not formerly listed. *Armstrong Bros. Tool Co.*

2—Abrasive wheels. Sanding and polishing complex contoured surfaces are simplified with Type B Flex Drum, a super-resilient abrasive cloth wheel. Data Sheet FD-30 (6 pages) lists grit grades and drum shapes. *Merit Products.*

3—Turret drilling machines. Here's a 16-pager with description and specifications for 10 tape-controlled systems for three models of maker's turret drills. Includes case histories of installations; also photos. *Burgmaster Corp.*

4—Power presses. Bulletin (No. AD-108, 2 pages) shows the advantages of using Saf-T-Bloc, an 11-lb. safety positioner that diminishes accident potential during die servicing and reduces power press downtime. *Duff-Norton Co.*

5—Lathes. Specifications and descriptions of four sizes of heavy-duty lathes are given in a 16-pager (HD-1016). These 20-hp. machines offer 27 different spindle speeds and provide from 17½- to 25-in. swing over the beds. *R. K. LeBlond Machine Tool Co.*

6—Blister packaging. This 24-pager tells about blister packaging and thermoforming. "Blister Packaging Facts" covers the hows, whys, dos, and don'ts on materials, printing inks, assembly methods. *The Jackmeyer Corp.*

7—Plant equipment. Here's a 64-pager (No. 33) that covers buying data for 110 different types of maintenance, safety, and production equipment. It features drawings, how-to-use photos, and prices. *Martindale Electric Co.*

8—Roller rebuilder. Bulletin M1-402 (4 pages) describes use of dual-head Micro-Matic machine for rebuilding worn heavy-duty rollers and wheels. Advantages cited: automatic control, simplicity of operation. *Automatic Welding Co.*

9—Hole measurement. Catalog No. SFI-22 (4 pages) presents coordinate measuring machine that visually computes the distances between holes and surfaces in two dimensions faster than conventional methods. *The Sheffield Corp.*

PIPES AND VALVES

10—Valves, accessories. This 6-pager is a condensed bulletin (No. 91051) that describes and illustrates valve cylinders, pumps, and special controls. Lists optional features, specifications, and the like. *Airmatic Valve, Inc.*

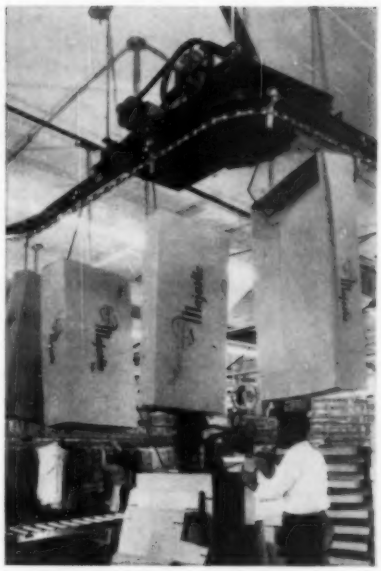
11—Cylinder pipe. Here's a handy pocket-size, 12-page manual with step-by-step procedure for tapping prestressed concrete steel cylinder pipe under pressure. Tells how small and large taps can be made quickly. *Price Bros. Co.*

12—Stainless steel valves. Design features, construction, and other data are set forth in comprehensive 132-page catalog. Covers ball, gate, globe, check, angle, sampling, tank, and needle valves; accessories. *Cooper Alloy Corp.*

13—Unions, fittings. This 16-page supplement to company's Catalog No. 57 gives details on designs, weights, and dimensions of unions and union fittings. Engineering specifications include diagrams. Photos. *Jerguson Gage & Valve Co.*

14—Ball valves. Information on manually and pneumatically operated valves in sizes ¼ through 12 in. is contained in Catalog No. 1200 (32 pages). Diagrams show variety of special valves and automatic valve hook-up. *Hills-McCanna Co.*

Turn the page



AERIAL CARTON STORAGE GIVES PROFITS A LIFT

Any manufacturing or warehouse operation that uses multiple packing stations or many kinds and sizes of cartons can profit from handling empty cartons on Rapistan overhead trolley conveyor. Present users are enjoying these benefits:

1. Automatic delivery of assembled cartons to point of use reduces handling labor.
2. Less floor space required for each packing station.
3. Mobile storage of made-up cartons off the floor.
4. Central stitching or stapling area for carton set-up close to knocked-down carton storage.
5. Removal of containers from unload areas.
6. Recirculation of tote boxes or other containers.

With a Rapistan system, one manufacturer gained a 10′ x 15′ office and space for 9,000 inventory items where empty cartons used to be stored—and reduced carton handling costs at the same time.

For other examples of money-saving overhead systems for handling empty containers, write Rapistan-Keystone, Inc., 546 Rapistan Bldg., Grand Rapids 2, Mich. Ask for report No. RK-13.

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An Apex universal wrench gives your power tool the flexibility needed to get right on fasteners located deep down where operating space is limited . . . even makes it possible to work around obstructions. Meets all safety requirements, will not bind or lock, even at maximum operating angle.

There are 1,268 types and sizes of Apex universal wrenches and extension universal wrenches among the more than 7,000 stock types and sizes of Apex fastening tools, each one developed to help reduce your fastening costs. In addition, we'll quote promptly on specials.

CATALOG 30-A—Nut Running Tools to ⅝" Drive. CATALOG 30-C—Screwdriving Tools.
CATALOG 30-B—Nut Running Tools over ⅝" Drive. CATALOG 30-D—Special Fastening Tools.

APEX FASTENING TOOLS
SCREWDRIVING • NUT RUNNING • SPECIAL
The APEX Machine & Tool Co. • 1023 So. Patterson Blvd. • Dayton 2, Ohio

Begins on page 193

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

15—Stemi-steel valves. This 44-pager is revised bulletin (V-203) that contains specifications and dimensions for all sizes of straightway, steam-jacketed, multiport, and special order valves. Lists accessories. *Rockwell Mfg. Co.*

16—Unions. Details on designs, weights, and dimensions are given in 16-pager. Includes engineering specifications and information on materials. Photos. *Stockham Valves & Fittings Co.*

INSTRUMENTS AND CONTROLS

17—Speed-measuring systems. Bulletin GEZ-3251 (12 pages) describes complete line of a-c and d-c tachometer generators and indicators. Information on applications, calibrations, and method of selection. *General Electric Co.*

18—Semiconductor testing. Requirements of in-circuit testing with particular application to diodes, rectifiers, and transistors are discussed in pocket-size, 12-page guide. Describes operation of test set. *Molecular Electronics, Inc.*

19—Bronze meters. This 8-pager (P&I-666) illustrates the construction and component parts of line of meters in sizes from ½ to 2 in. Gives specifications, dimensions, list of 207 liquids that can be metered. *Rockwell Mfg. Co.*

20—Dial indicators. Flexibility in design and the use of cabinet and pillar dial indicators are described in Catalog ASB 300.11 (8 pages). Cutaway photos show full-floating, double-pendulum Floaxial mechanism. *Fairbanks, Morse & Co.*

21—Two-way mobile radio. General facts about two-way communications are given in 28-page Bulletin ECR-497B. Covers mobile and

Handling Coil with a TRAK-RAK CRANE

can bring you:

1. Up to 4 times greater storage capacity in the same area.
2. Manpower savings up to 70%.
3. 100% selectivity.
4. Increased handling speed and safety.
5. Overall reduction in warehousing costs.

This Trak-Rak Crane system, recently installed at Samuel Son & Company, Toronto, is one of approximately 300 Trak-Rak installations at work today. Operating efficiently and with an absolute minimum of maintenance, these Trak-Rak installations have solved many coil, sheet, palletized material and order picking problems.

Learn how a TRAK-RAK Crane can help you.

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Pioneers in the stacker crane field

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CHICAGO TRAMRAIL DIVISION

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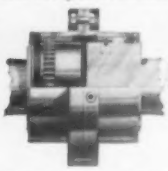
AJAX  **DIHEDRAL COUPLINGS**

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Prime-Mover Pallet Trucks represent the latest engineering design—most efficient production techniques— strongest modern materials. Fewer and stronger parts mean longer, trouble-free, dependable service and performance.

The sealed hydraulic system is precision machined with ground finishes to maintain positive, leak-proof operations. All wear points are cast and machined rather than formed or stamped. Up-dated and made to traditional PRIME-MOVER high standards.

MODEL P-25
$359

MADE IN TWO SIZES:
2500 lb. capacity, Model P-25
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Available in 20½ and 27 inch widths; in 36, 42, 48 inch fork lifts. Model P-25 costs only $359; Model P-45 costs only $395.

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For more facts Circle 521 on Reader Service Card

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CATALOG NEWS

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portable equipment, base stations, federal regulations, frequency and power data. *General Electric Co.*

22—Data processing. "Preparing for an Electronic Data Processing System Installation" (8 pages) outlines five steps needed for efficient, economical operation of the system. *Philco Corp.*

23—Dielectric testing. Bulletin GEA-7178 (12 pages) describes high-voltage test equipment that includes complete line of 15 a-c and 9 d-c standard ratings. Information on how to select test sets. Photos. *General Electric Co.*

AUXILIARY

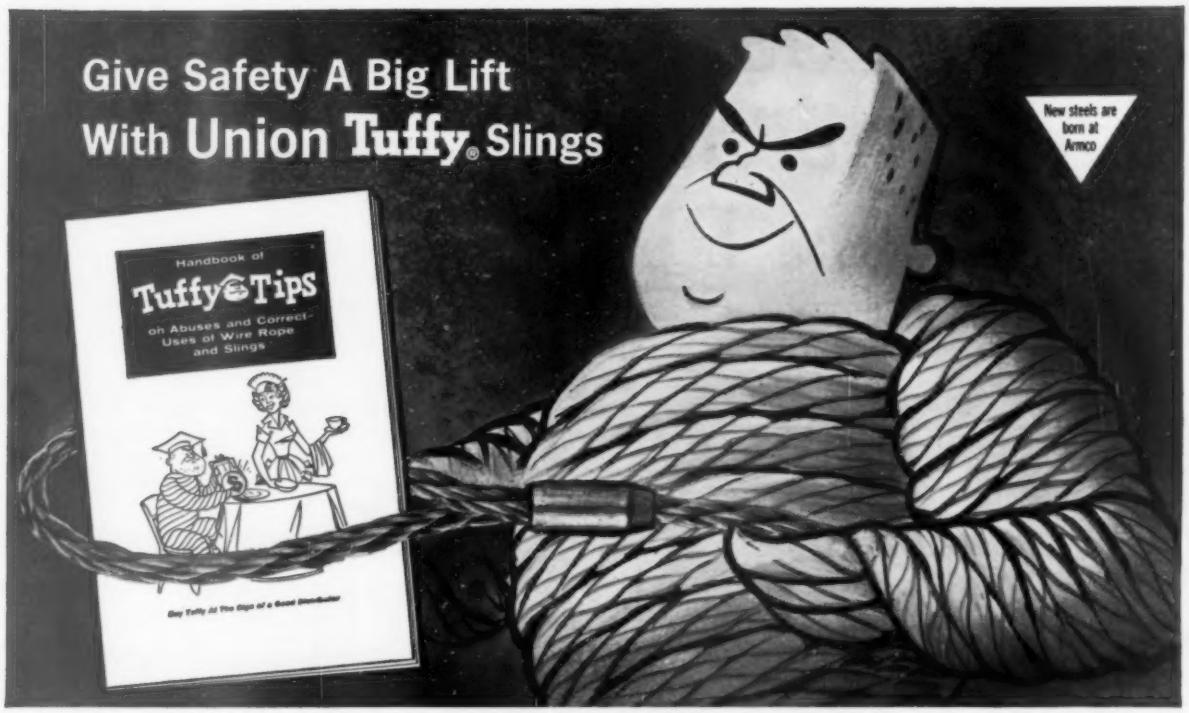
24—Compressors. The performance characteristics of two-cycle gas engines in variable-speed, variable-load applications are discussed in 4-pager (No. 205). Explains constant pressure turbocharging, and other advantages. *Clark Bros. Co.*

25—Air conditioners. This 12-pager (AC201) presents line of room air conditioners and tells how Unitaire's face and by-pass damper control keeps temperature and air circulation constant. Includes selection data. *Airtherm Mfg. Co.*

26—Infra-red burners. Design features and advantages of these burners are described in Bulletin H-19 (4 pages). Made in 6x12-in. sections, units come with end- or bottom-flanged inlets. Drawings. *Eclipse Fuel Engineering Co.*

27—Centrifugal pumps. High-pressure multi-stage pumps with capacities to 2600 gpm. for heads up to 3400 ft. are covered in Bulletin 722.4 (8 pages). Performance curves, photos. *Goulds Pumps, Inc.*

28—Tank heaters. Here's an 8-pager (No. 1623) that illustrates and describes vertical and horizontal


Give Safety A Big Lift
With Union Tuffy® Slings
Handbook of
Tuffy Tips
on Abuses and Correct Uses of Wire Rope and Slings
New steels are born at Armco

Union's Tuffy has written a book. The purpose is to make a mental contribution to Safety—one that will supplement the physical safety factors Tuffy Slings have contributed through a unique combination of strength and flexibility.

The many Tuffy Tips in the book, on the proper use of slings and hoist lines, will prove almost as helpful in providing longer service as has the patented 9-part machine-braided wire fabric construction of Tuffy slings. Send for this book—no charge to sling users. See how Tuffy-Tips, Tuffy Slings and Tuffy Hoist lines work in hand-and-glove harmony to cut hoisting costs and down time in every kind of materials handling.

Four Special Union Wire Slings

In addition to famed Union Tuffy Slings, Union Wire Rope offers, in a full range of sizes:

1. **Hand Braided** six and eight-part slings.
2. **Uni-ply**—a flexible multi-part rope laid sling with pressed-on metal ferrule.
3. **Press-Grip** wire rope sling with pressed-on metal ferrule.
4. **Uni-Grip** wire rope sling with return loop splice and pressed-on metal ferrule.

Union Wire Rope Tuffy Tips on safe use of Slings and Hoists

Safety Council Cites Factors In Lifting Injuries:

The National Safety Council points out that nearly a fourth of all compensation cases are the result of unsafe handling, cautions against:

"(a) Handling loads that are too heavy; (b) lifting or lowering with back instead of leg muscles; (c) handling load with an insecure grip and failing to watch where hands are placed; (d) handling without sufficient help or failing to use mechanical equipment; (e) handling before getting a firm footing; (f) lifting or lowering with a jerking, twisting movement, or when the body is in an awkward position."

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1. "Tuffy Tips." Many more safety hints. Tells how to get longer service from slings and wire rope. Chock-full of do's and don't's to save money.
2. "Tuffy Sling Handbook." Helpful data on the selection and use of slings —types, dimensions, weights, fittings, rated loads, safety-approved signals.

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Begins on page 193

CATALOG NEWS

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heaters using one-weld single-pipe construction. Lists specifications, capacities, and dimensions of tanks. *The Griscom-Russell Co.*

29—Heat exchanger. Catalog Section S-6813 (8 pages) has construction data on new Karbate impervious graphite counterflow block exchanger. Pressure-drop characteristics for single-, three-, and five-pass units. *National Carbon Co.*

MATERIAL HANDLING

30—Lift trucks. This 16-page "Facts and Factors About Gas-Powered Lift Trucks" discusses flexibility of gas power plus efficiency of electric drive offered in company's GLF series. Photos. *Automatic Transportation Co.*

31—Cranes. Bulletin 6-B (12 pages) describes cranes with new direct-drive, ample-sized controllers, forged steel wheels, a heavy-duty hoisting unit, and precision or roller bearings. Tables of dimensions. Photos. *Abell-Howe Co.*

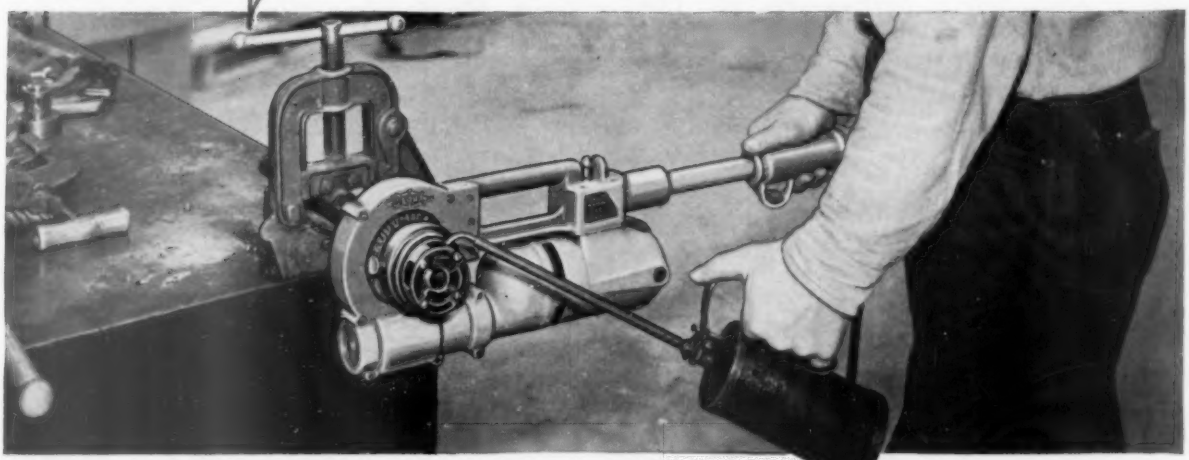
32—Shipping containers. Here's a 34-page "Packaging Guidebook" to help you select the right container for a specific product. Information on corrugated construction principle, three types of liner-board, shapes. *Olin Containers.*

33—Belt conveyors. This 11-page catalog covers specifications for conveyors from 9 to 99 ft. long and 18 to 36 in. wide. Includes charts on bulk material classifications, belt capacities, speeds; data on terminals. *Finco, Inc.*

34—Packing scale. Brochure 2112a (4 pages) shows 5-lb.-capacity net weight scale designed for check-weighing, filling, issuing predetermined quantities, and count-by-weight operations. Lists commodity equipment. *Toledo Scale Corp.*

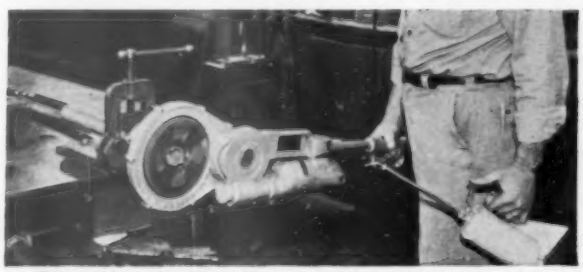
Turn the page

"Nothing Ever Saved More Time....."

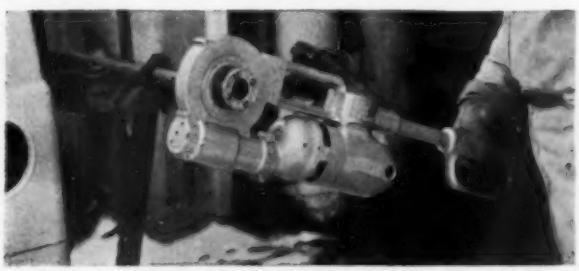


than the new SIOUX Power Pipe Threader!

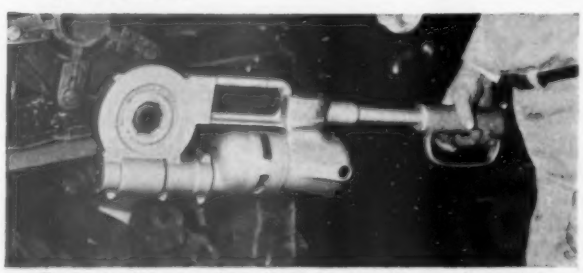
WITH THE SIOUX POWER PIPE THREADER you can thread ¼" to 1" pipe in 20 seconds; 1" and 2" pipe in one minute, 24 seconds! When labor costs 6½ cents per man per minute, a power tool like this for which there is a continuing need doesn't take long to pay for itself. The SIOUX Power Pipe Threader is said to be saving more time and money than any other major portable power tool!



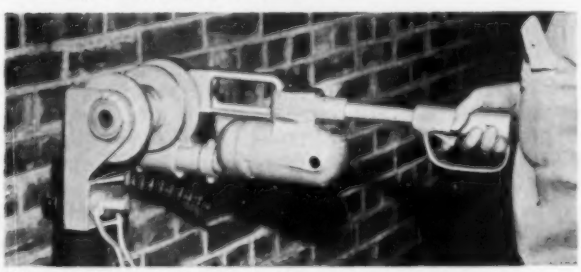
SIOUX NO. 1508 PIPE THREADER in use with No. 1511 Speed Reducer.



THREAD PIPE ON THE JOB, in a hurry. Once the unit is in place it only takes one hand.



DRIVING GEARED DIE STOCK with SIOUX No. 1508 Pipe Threader and No. 38002 Adaptor.



WIRE IS PULLED THROUGH CONDUIT with SIOUX No. 1508 Pipe Threader and No. 1509 Portable Winch.

Your SIOUX Power Pipe Threader will also thread bolts; drill; auger; and open and shut valves. (It's a versatile, portable power package!)

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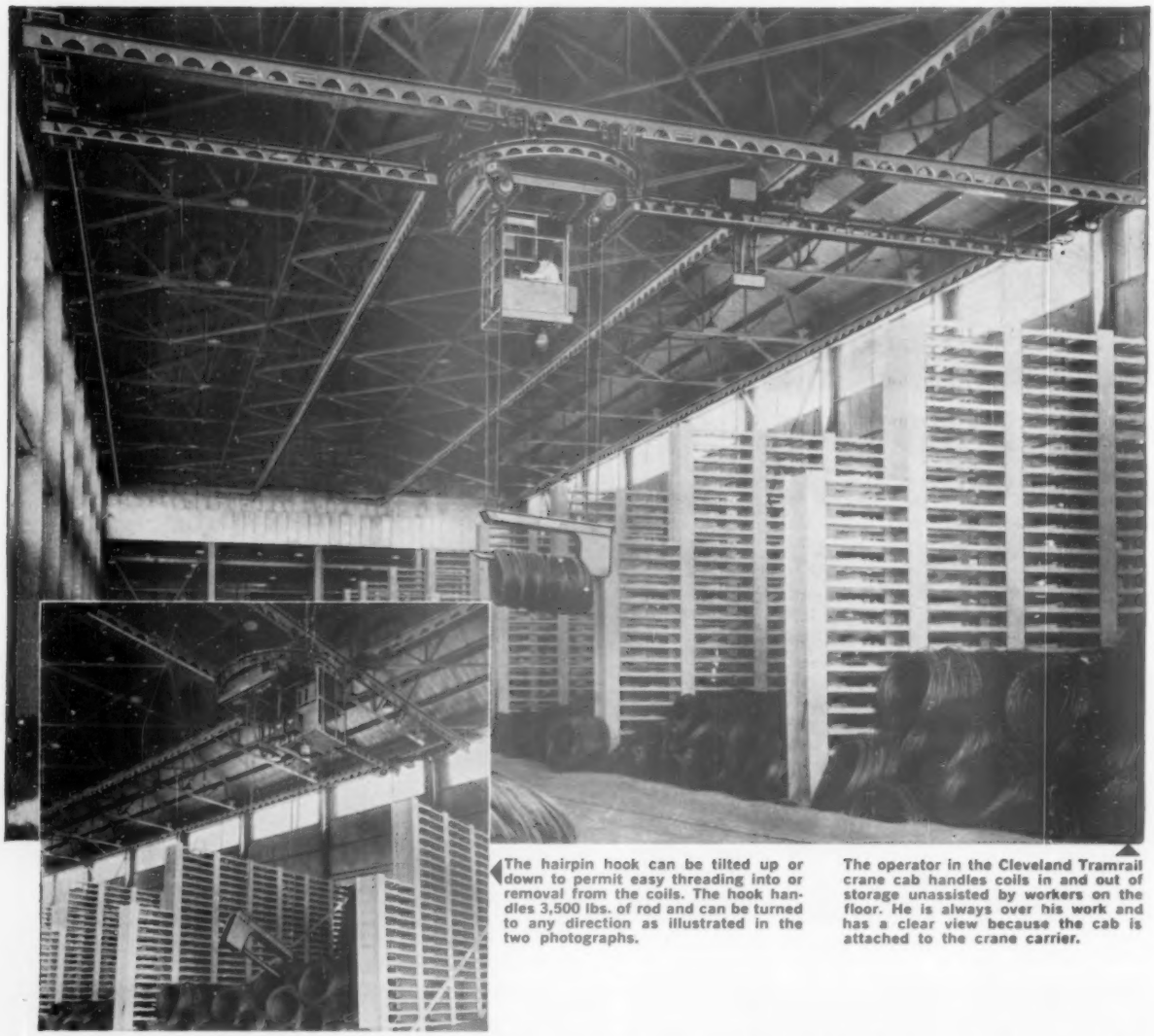
Crane with ROTATING CARRIER

Provides Ultimate In Wire and Rod Handling Efficiency



The hairpin hook can be tilted up or down to permit easy threading into or removal from the coils. The hook handles 3,500 lbs. of rod and can be turned to any direction as illustrated in the two photographs.

The operator in the Cleveland Tramrail crane cab handles coils in and out of storage unassisted by workers on the floor. He is always over his work and has a clear view because the cab is attached to the crane carrier.

Five motions: hoisting, tilting, trolley travel, bridge travel and rotation are provided in a Cleveland Tramrail crane for handling coiled rod. The trolley travels on a 76-foot double-girder crane bridge from side to side of a building. A rotating carrier operates on a circular track built into the trolley. It turns unlimitedly in either direction. The crane travels on four runway tracks and is controlled from a cab which is attached to the carrier.

Coiled rod is picked up from incoming railroad cars by a hairpin-type hook and turned 90 degrees for placement into large bins along one side of the storage building. The hook can be tilted either up or down for threading into or drawing away from the coils.

The unit handles 3,500 lbs. of rod in addition to the weight of the hairpin hook. Bridge and trolley control are variable five-speed magnetic with dynamic braking. Hoist control is variable-speed drum type with dynamic lowering. Rotating control is automatic accelerating.

With a wealth of experience to draw on, Cleveland Tramrail engineers are in position to help you with a wide range of materials handling problems. We welcome an opportunity to work with you.

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CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION · THE CLEVELAND CRANE & ENGINEERING CO. · 3230 E. 288 ST. · WICKLIFFE, OHIO

Begins on page 193

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

35—Sling chains. Catalog DH-39-B (8 pages) describes components for a complete sling chain. Charts give components for 1-, 2-, 3-, and 4-leg slings, load limits. *American Chain & Cable Co., Inc.*

36—Marking devices. This comprehensive 48-pager (No. 300) describes over 200 marking tools, fixtures, and automated machines. Hand tools range from a dozen styles of steel stamps to more than 20 holders. *M. E. Cunningham Co.*

37—Storage equipment. Booklet 4368 (16 pages), "12 Losses Penco Planning Can Control," helps planners achieve their main storage objectives. Many application photos. *Alan Wood Steel Co.*

38—Bucket elevators. Here's a whopping manual (No. be-55, 84 pages) that illustrates wide selection of basic bucket-elevator types. Lists eight factors to consider when solving a given handling problem. *Webster Manufacturing, Inc.*

39—Packaging. The right bag for your product with the right equipment to fill it is the subject of two catalogs. The 8-pager describes paper, burlap, other bags; the 24-pager explains packaging service to bag user. *St. Regis Paper Co.*

BUILDING

40—Metal buildings. Catalog BD-2602 (6 pages) provides specifications for rigid-frame buildings available in clear-span widths from 32 to 120 ft. Come ready to assemble with factory-fitted parts. *The Parkersburg Rig and Reel Co.*

41—Air diffusers. How to select and install diffusers for integral mounting with air handling troffers for ceilings—Catalog CLD-70 (8 pages) tells all. Includes drawings. *Anemostat Corp. of America.*

Turn the page

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MOTOROLA RADIO PAGING ASSURES PROMPT, PRIVATE CONTACT ANYWHERE IN AND AROUND YOUR PLANT

Now you can "pinpoint" your key men ...reach them instantly and privately anywhere on the job. Each of your key men wears a tiny, pocket-size radio receiver. To contact the man you want, you dial his paging number on your telephone and talk...or have your message relayed to him from a central point. An alerting tone sounds in his Pager...commands his immediate attention. He presses a button and receives your complete voice message.

HERE'S WHERE RADIO PAGING REALLY SAVES TIME AND MONEY...

Industrial Maintenance...When production equipment breaks down, the right man is called immediately—no time-consuming track-downs; down-time is held to a minimum.

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Combinations tailored to your specific needs...Motorola Radio Paging is flexible...adaptable to any plant, large or small.

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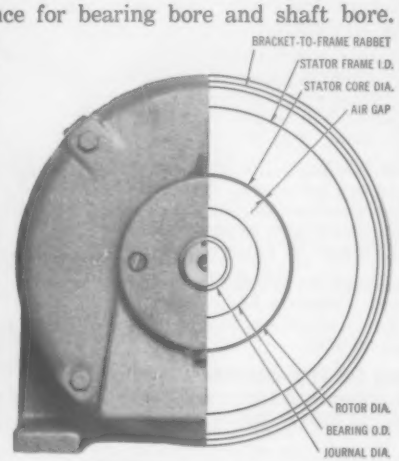
A MOTOR IS A SERIES OF CIRCLES

Checking bracket rabbet of an Elliott C-W Motor

The smooth, quiet, cool operation of Elliott Crocker-Wheeler motors is a direct result of the accuracy and concentricity of the "circles" that are its most important dimensions. Some of these circles are identified in the drawing below.

The bracket rabbet is a reference for bearing bore and shaft bore. Through matching jigs, the rabbets and bores of the stator are made accurately concentric with the bracket. Thus, when the motor is assembled, the series of concentric circles has been accurately established. With all parts in alignment, there is no preloading of bearings, air gap is uniform, noise is minimized, heat transfer expedited, smooth, trouble-free operation assured.

The highly-perfected, precision manufacturing processes by which Elliott achieves this vital concentricity are described by a booklet, *The Fine Art of Building Better Motors.* We will be happy to send you a copy. Contact nearest Elliott office, or write Crocker-Wheeler Division, Elliott Company, Jeannette, Pa.



Precise fit and concentricity of brackets to frame, frame to core, shaft to rotor and bearings, and bearings to brackets gives Elliott C-W Motors long life, trouble-free operation.

Elliott Crocker-Wheeler integral-hp a-c and d-c motors—from smallest to largest—are offered in all conventional enclosures and modifications; with insulation to suit the application, including EPA-SEAL the epoxy insulation used where conditions are very severe. W1-4

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Begins on page 193

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

42—Acoustical ceiling systems. Here's a 4-pager (11bF1) that tells about cost-saving features of Rigid-Grid suspension systems. Describes two typical installations. Drawings show the five basic components. *Flangeklamp Corp.*

43—Built-up roofs. This 28-pager has specifications, easy-to-read roof selector guide, construction and other data. Application details on steep deck and dead level roofs, insulation, joint sealing. *The Philip Carey Mfg. Co.*

PLANT SITES

44—Nebraska. You'll find many reasons for going west in an informative fact file covering 23 cities in this state. Statistics on taxes, labor supply, transportation, low-cost utilities, growth. *Nebraska Public Power System.*

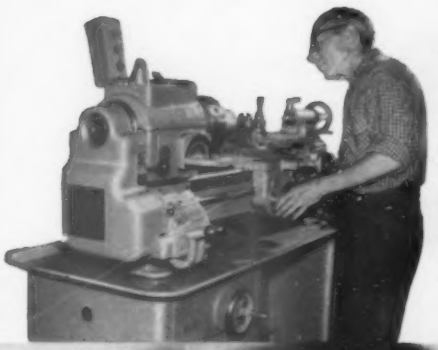
45—Nebraska. Another breakdown of this state's resources is given in a 12-pager. Covers labor potential, educational facilities, recreation opportunities, climate, etc. *Nebraska Resources Div.*

46—Michigan. Two well-illustrated 16-page booklets tell about advantages the city of Grand Rapids offers industry. Discusses labor and wage scales, natural resources, pattern for growth. *Greater Grand Rapids Chamber of Commerce.*

MAINTENANCE

47—Concrete floor care. Booklet No. 14, "Methods of Curing, Sealing, and Cleaning Concrete Floors," is an 8-pager about maintenance procedures. Tells how to remove soil and stains, prevent dusting, etc. *Puritan Chemical Co.*

48—Sprinkler alarm systems. Here is a catalog that points out the need for these systems and shows



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Checking closely on tolerances, time and dollars? These accurate, versatile, low-cost machines can pay their way on your jobs. To see a Delta Metal Lathe in action, write for the name of your nearest Delta Lathe Dealer and get a FREE CATALOG: Rockwell Manufacturing Company, Power Tool Division, 628G North Lexington Avenue, Pittsburgh 8, Pennsylvania.

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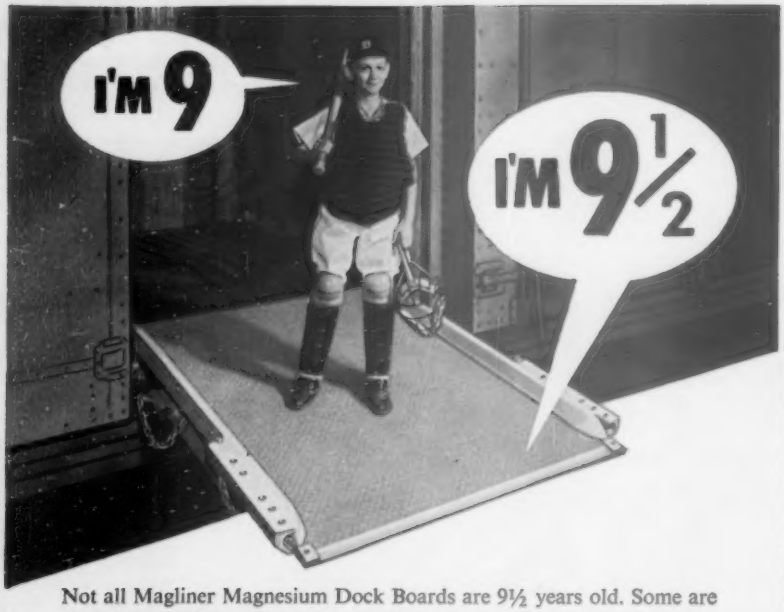
another fine product by

ROCKWELL



Not all Magliner Magnesium Dock Boards are 9½ years old. Some are even older, and thousands are newer. The old ones, you see, sell the new ones as more companies discover that *longer* quality and *longer* service life are built into every Magliner. They're man savers, time savers, *money-savers*, too! Send today for your copy of "Difficult Dock Problems"—the bulletin that helps you *spot and correct* high-cost dock loading problems.

Request Bulletin DB-204, Magline Inc., P. O. Box 37, Pinconning, Mich.

MAGLINER MAGNESIUM DOCK BOARDS

For more facts Circle 529 on Reader Service Card

NEW

EASY-TO-USE STEEL GRATING CATALOG

SEND NOW FOR YOUR **FREE** COPY

Dept. F-7 **KERRIGAN IRON WORKS CO.** Nashville, Tenn.

NAME _____

FIRM NAME _____

CITY _____ STATE _____

Begins on page 193

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

how they work. Information helps you pre-plan an automatic water-flow alarm. Details on sprinkler supervisory systems. *Autocall Co.*

49—Boiler troubleshooters. A five-step program for solving water-conditioning problems is presented in 4-pager (CS113). Chart lists 23 common troubles caused by water and fuel contaminants; suggests treatments. *Ionac Chemical Co.*

50—Maintenance products. This 12-page booklet describes floor strippers, chemical specialties, waxes, protective finishes, and other sanitary maintenance products. Includes preventive maintenance program aids. *Hadco Corp.*

51—Floor care. Solutions to many floor problems are given in Catalog F-1425, "A Guide to the Armstrong Commercial Floor Maintenance System." Has 24 pages on proven methods for resilient floor care. *Armstrong Cork Co.*

ELECTRICAL

52—Switchgear. This 20-pager (No. 3200-1A) covers low-voltage power circuit breakers and switchboards in unit ratings from 225 to 4000 amp. Features include closed-door drawout, new bus arrangement. *I-T-E Circuit Breaker Co.*

53—Range drives. The Varidyne system that keeps all motors completely "in step" without use of tachometer feedback or other devices is explained in 6-page brochure (F-2028). Schematics of applications. *U.S. Electrical Motors.*

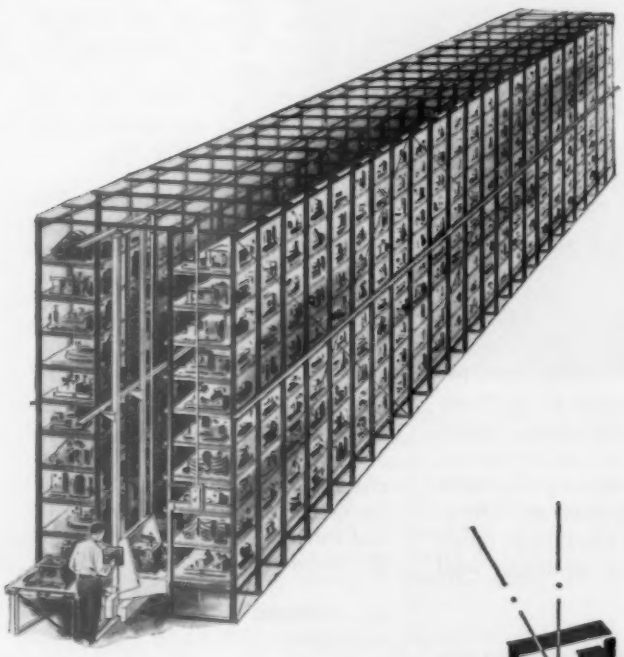
54—Insulated cable. Reference manual (No. 1131, 48 pages) tells all about butyl-base rubber-insulated cables for multi-purpose service up to 90 C. Data on current-carrying capacities, dimensions, etc. *The Okonite Co.*

Turn the page

5000

tools and dies available at fingertip control

Without moving from the end of the aisle, an operator directs the movements of the TRIAX® **Retriever®** on this new two-way control console. He sets the controls to deliver one load to a vacant opening and to bring another load back at the same time.



In this sample TRIAX® **Retriever®** material handling installation, an estimated 5000 tools or fixtures could be stored at random, with immediate access to any one of them.

The standard line of 19 sizes of pre-engineered standard **Retrievers** offers great adaptability to a number of material handling and storage problems.

A **Retriever** can save large amounts of valuable floor space, utilize all air space from floor to ceiling, and often effect considerable saving in labor costs.

Retrievers are now in service in varied capacities . . . work-in-process storage, tool and fixture storage, a distribution center for finished products and finished parts storage.

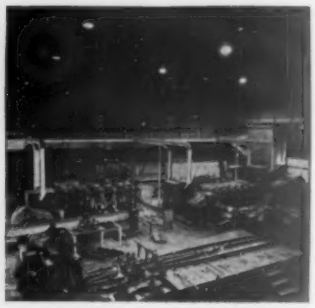
We would welcome the opportunity to discuss possible **Retriever** applications in your present or future plant or warehouse.

THE TRIAX COMPANY

SWeetbriar 1-9800

1361 CHARDON ROAD • CLEVELAND 17, OHIO

Wheelabrator ultrafiltration provides air cleaner than you breathe



In this mill room, a Wheelabrator Ultra-Filtration® unit has eliminated the cost of 24 man-hours of maintenance labor a week in upkeep of 3 roughing mill drive motors.

A demonstration of WHEELABRATOR'S

VITAL VALUES

Air that's pure—really pure—is vital to the operation of steel mill drive motors. And ultimate purity of the filtered air is one of the Vital Values you get with Wheelabrator Air Filters. At a prominent steel mill, installation of Wheelabrator Ultra-Filtration to provide clean air to three drive motors totaling 2,200 h.p. has virtually eliminated weekly motor maintenance attention, saving $3,120.00 in direct labor cost alone per year. Added to this saving, mill room down time costing $6,000.00 annually due to motor trouble has been avoided. Wheelabrator Ultra-Filtration provides the air purity required, at a cost far lower than many systems offering less efficiency. Get the whole story of these vital savings. Write today for information.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR AIR FILTRATION

WHEELABRATOR CORPORATION, 374 S. Byrkit St., Mishawaka, Indiana,
In Canada, WHEELABRATOR CORP. of Canada, Ltd., P.O. Box 490, Scarborough, Ont.

Begins on page 193

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

55—Rectifiers. Bulletin GEA-7066 has six pages of information on new silicon d-c power supplies rated from 0.75 to 75 kw. Gives construction and operation data. Illustrates three basic types and their uses. *General Electric Co.*

56—Motors. Motor application guide (No. 010, 16 pages) describes single-phase, three-phase, and direct-current motors. Selection charts match motor features to specific applications. Ratings, dimensions. *Century Electric Co.*

57—Bus ducts. Construction details and specifications are given in 8-page application data bulletin (30-666). Diagrams show straight lengths, elbows, tees, hangers, plug-in devices, and other units. *Westinghouse Electric Corp.*

58—Torque motors. Bulletin 208A (4 pages) contains speed-torque curves, duty specifications, dimensions, and wide range of ratings. Motors can be used for operating brakes, clamping mechanisms, etc. *The Ohio Electric Mfg. Co.*

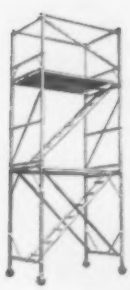
59—Electrification systems. This 44-page bulletin (No. 85) describes 100-amp. steel-enclosed trolley busway system; also 100-amp. continuous service, 150-amp. intermittent service, and crane and hoist systems. *Feedrail Corp.*

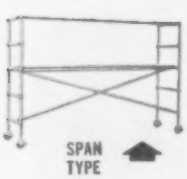
60—Rectifiers. More than 150 silicon diffused rectifiers are covered in this 6-page catalog. Gives mechanical and electrical specifications for units from 50 to 600 volts PIV, and from 250 milliamp. to 22 amp. *Raytheon Co.*

61—Ballasts. Here's a cross-reference guide (CR-61, 6 pages) that indicates maker's "service guaranteed" ballast catalog number equivalents for fluorescent lamp ballasts of other makes. Includes mounting dimensions, ratings, and the like. *Universal Mfg. Corp.*

$10,000 LABOR SAVED ON IN-PLANT REMODELING

Up-Right aluminum scaffold-on-wheels gets men up in the air fast...lets them finish the job fast! Lightweight and quickly assembled without tools or loose parts, Up-Right scaffolds are adjustable to provide a safe, convenient working platform at any desired height. In 3 basic types for overhead installation and maintenance.





HERE'S HOW INDUSTRY SAVES ON OVERHEAD MAINTENANCE WITH NEW ALUMINUM SCAFFOLD

Working from 2 sets of stairway-type scaffolds, regular maintenance personnel recently completed a 2½ year program of overhead remodeling at Waco, Texas, plant. Interiors and exteriors of 4-story buildings were painted, 400,000 square feet of metal ceilings were replaced with acoustical tile and complete new electrical, heating and plumbing systems were installed. Up-Right portable aluminum scaffolds provided savings in labor cost estimated at $10,000 and contributed to a perfect safety record for the 2½ year period. Scaffolds were rapidly assembled to reach desired height and rolled with the job.

Write for descriptive circulars

UP-RIGHT SCAFFOLDS

DEPT. 178, 1013 PARDEE, BERKELEY, CALIFORNIA

In Canada: Up-Right Scaffolds, Ltd., 120 Russet Ave., Oshawa, Ontario

For more facts Circle 533 on Reader Service Card

MATERIALS NEWS

For more data, circle item numbers on Reader Service Card next to back cover.

Instant mix for Magnaflux bath

Magnaflux testing—used for over 30 years to locate invisible cracks in ferrous materials—has taken a big step forward with the development of concentrates in powder form for quick, easy mixing of magnetic bath suspensions. Before this, several tedious steps were required for mixing and dilution. Now a family of eight different concentrates has only to be measured in a graduated cup, then added to the tank of oil or water and you have your mix. *Magnaflux Corp.* (Circle 195)

New breakthrough in galvanized steel

A new spangle-free, hot-dipped zinc-coated steel has been developed to improve the paintability and spot-welding properties of this workhorse of the metal fabrication industry. Called Zincgrip A, Paintgrip, the material carries a 1.25-oz. class zinc coating as specified by the ASTM A-93. It's expected to challenge existing zinc-coated sheets that can only meet painting requirements on certain applications by using a lighter coating of zinc. Photo at left shows test panels. *Armco Steel Corp.* (Circle 196)

197—Lubricating grease to meet the extreme requirements for lubricating ultra-precision instrument bearings has just been announced. Minapure grease is said to be world's cleanest —400 times cleaner than those previously available. *Miniature Precision Bearings, Inc.*

198—Anodized aluminum trim is being used to dress up products as small as a drawer handle or as large as an automobile. Material is available in sheet or strip form, in any combination of colors, and in stock or custom designs, shapes, sizes. *Anodyne, Inc.*

199—Fire-retardant coating, named Hel-Met, can be applied on interior surfaces such as wood, cellulose, board, paper, plaster, or metal. Heat causes this new protective coating to bubble out into an insulating mat of carbonaceous foam. *Empire Coatings and Chemical Co.*

T&G joints insulate

. . . tongue and groove joints, that is, in either Styrofoam or urethane preformed insulation modules designed for pipe and process vessels. Vapo-Lock offers the user "multiple layer efficiency with single layer cost," is easy to install, economical, durable, re-usable. It operates from −350 F. to +220 F., and resists fungus, vermin, and insects. *MMM Inc.* (Circle 200)

Turn the page

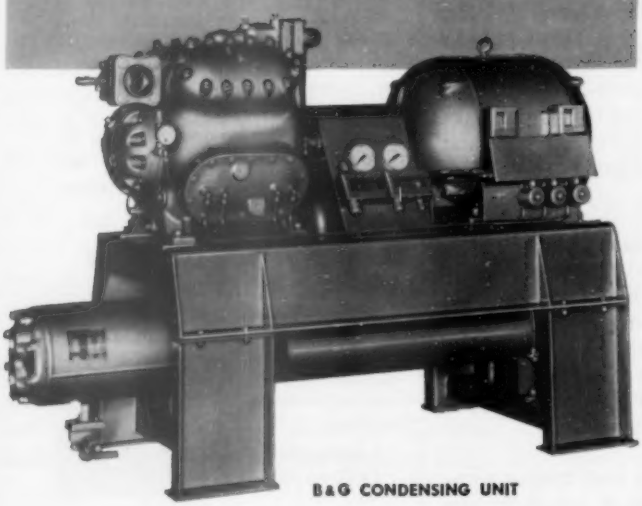
Final factory check-out. These cooling units will be shipped with everything mechanically correct and in accordance with the requirements of the order.

For cooling in shops and offices... or process work

M-PAK*

units most efficiently solve the problem...

*MODULAR PACKAGES



B&G CONDENSING UNIT

Summer cooling in shops and offices has long since proved its value as a stimulant to increased worker morale and productiveness. B&G Modular Packages (M-Pak units) now make it possible to provide it more economically and dependably.

Here is a new advance in efficiency designing of air conditioning and refrigeration equipment. M-Pak units are built around five basic sizes of *open-type* compressors. Factory-stocked motors, condensers, evaporators and controls can be added to these basic units to make a comprehensive line of immediately available cooling "packages" of from 7½ to 150 tons.

B&G builds "open-type" compressors because they offer many exclusive and outstanding advantages...no danger of motor trouble causing system contamination with consequent excessive down-time.

All major components of M-Pak units are designed, manufactured and guaranteed by B&G... *one* responsibility for the entire package.

BELL & GOSSETT COMPANY

Dept. GS-13, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

Send today for complete information on Bell & Gossett M-Pak Air Conditioning and Refrigeration Units.

LET'S COME DOWN TO EARTH
on this
Plant Location Business

No area can be all things to *all* industries. But we've got down-to-earth facts that prove the Toledo-Northwestern Ohio area is right for these specific industries:

PAPER AND PLASTICS PRODUCTS
BUILDING AND STONE PRODUCTS
FOOD PROCESSING • CHEMICAL PROCESS
MACHINERY PRODUCTION
PRIMARY METALS • ELECTRONICS

These facts are reported in a study of the area by Fantus Research, Inc., one of the nation's foremost industrial location services. For more information, write R. E. Johnson, Manager, Industrial Development Department, The Toledo Edison Company, Toledo 1, Ohio.

THE TOLEDO EDISON COMPANY
an investor-owned electric light and power company serving Northwestern Ohio

Begins on page 208

MATERIALS NEWS

For more data, circle item numbers you want on Reader Service Card.

201—Glass-fiber panels, said to be up to five times better than conventional panels in resisting weather effects, are being produced under a new chemical formula. These new "XR1000" panels are ideal for skylighting, roofing, glazing, etc. *Barclite Corp. of America.*

202—Non-slip walkway coating, originally developed for wet and slippery ship decks, is now available for industrial use. Applications include catwalks on pipelines, tank trucks, structures, indoor truck docks, shower stalls, stairs, etc. *Akron Paint & Varnish Co.*

203—PVC plastic sheeting that can withstand boiling water has just been developed. Industrial possibilities for this new corrosion-resistant sheeting include PVC ductwork and tanks capable of handling strong acids and hot corrosive liquids. *Sieberling Rubber Co.*

204—Solid urethane sheets measuring 40x96 in. in gauges of 1/16, 1/8, and 1/4 in. for liner material, and Teflon-filled asbestos are two new products. The latter is inert to most chemicals over a temperature range of minus 425 F. to plus 500 F. *Auburn Mfg. Co.*

205—Asbestolite roof coating combines the virtues of heat-reflecting aluminum and moisture-repelling silicone. Severe temperature changes have no effect on this waterproof coating. It will not crack or alligator, but will remain resilient for years. *Monroe Co. Inc.*

Turn the page

EVANS
WHITE TAPES
Sizes from 6 ft. to 12 ft.
NOW EACH IN
BELT HOLSTER

CLIPS ON BELT!

Now, Evans gives industry more big savings in measuring tapes! Greater convenience and performance — with no increase in cost! Every Evans pocket tape, push-pull and power models, comes packaged in a strong, metal-reinforced vinyl-covered holster with belt clip. Makes measuring faster, tapes always handy. Your supplier will gladly demonstrate. Ask him about this Evans "extra" today.

YOUR COMPANY NAME ON TAPES...

Evans tapes can be supplied with your company name and advertising on each tape for presentation to your customers. It's a wonderful way to build good will. Available in individual gift package.

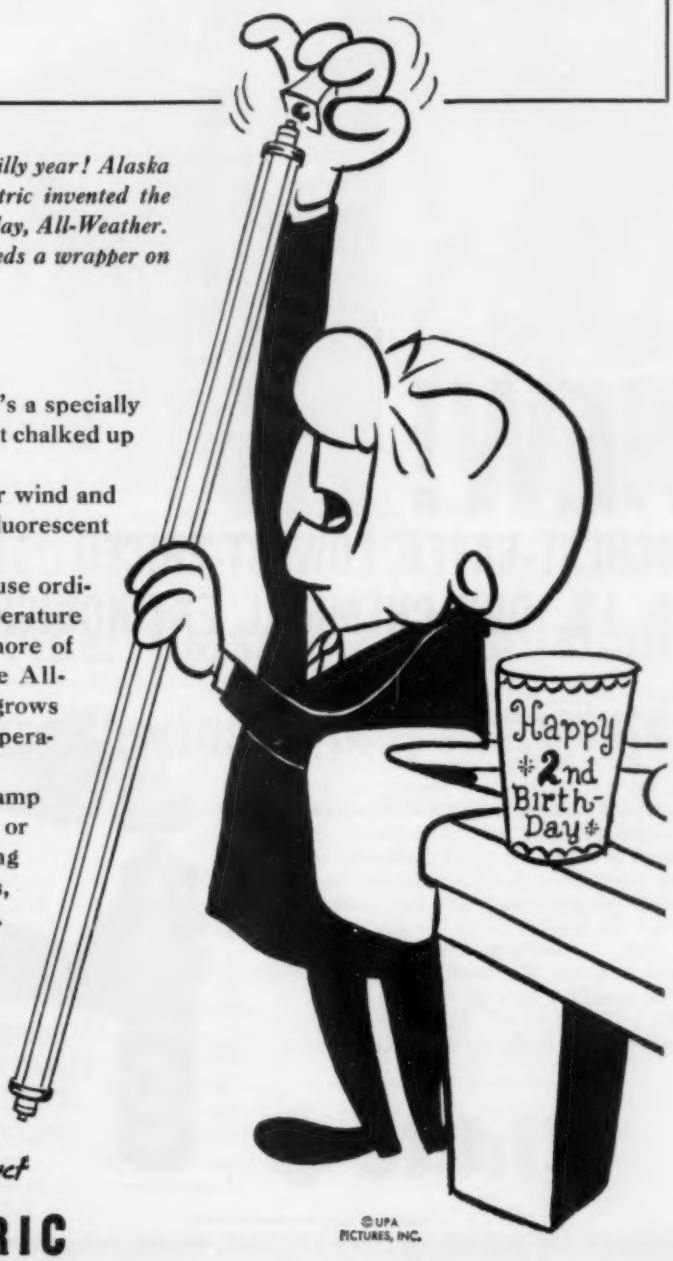
Send for illustrated folder #5807.

Evans RULE CO.
Factories at:
Elizabeth, N. J. & Montreal, Quebec

First from General Electric (1959)...another bright idea that became a better lamp for you

G-E All-Weather Fluorescents shine brighter when mercury drops

Mister Magoo says . . . "1959? A chilly year! Alaska joined the Union, and General Electric invented the All-Weather fluorescent. Happy birthday, All-Weather. Humph! Packaging experts! Who needs a wrapper on a pool cue?"



© UPA PICTURES, INC.

DON'T drop your cue, Mister Magoo. It's a specially jacketed All-Weather lamp, another first chalked up by General Electric.

It wears that glass jacket to ward off winter wind and cold. Below freezing, it's the most powerful fluorescent lamp you can buy.

General Electric developed this lamp because ordinary fluorescents grow dim when the temperature dives toward zero. Often they lose 90% or more of their warm-weather light output. But the All-Weather fluorescent T10J—a G-E exclusive—grows brighter the colder it gets! Use it where temperatures sometimes drop below 50°F.

You can use the T10J—or its companion lamp (T10) without the "storm window"—indoors or out. Examples: walk-in freezers, shopping centers, drive-ins, parking lots, street lamps, store fronts, airports, docks, signs, gas stations.

Both come in 4′, 6′, and 8′ lengths. Ask your G-E distributor to show you these two exclusive examples of General Electric lighting leadership. General Electric Co., Large Lamp Dept. C-111, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts Circle 537 on Reader Service Card

14" HIGH

NEW!

HIGHEST-RATED, LOWEST-PRICED ($11.95 RETAIL) 2½ LB. DRY CHEMICAL EXTINGUISHER

Now — thanks to the new Kidde Kompact — here's high-power fire protection at a rock-bottom price! Highest-rated, lowest-priced 2½ lb. dry chemical extinguisher on the market, the new pressurized Kidde Kompact packs as much fire-killing power as extinguishers costing twice the price. Equal to eight one-quart carbon tet units, the new Kidde Kompact mounts snugly, works simply — just lift the handle and press the lever.

And . . . there's no recharging needed. Just unscrew the used cylinder, replace with another, only $3.95. U.L., U.S.C.G. and I.C.C.-approved. For more information, see your dealer or write Kidde today!

QUICK REPLACEMENT CYLINDER ONLY $3.95

Kidde

Industrial and Marine Division

Walter Kidde & Company, Inc., 732 Main Street, Belleville 9, N. J.

Walter Kidde & Company of Canada Ltd., Montreal—Toronto—Vancouver

Begins on page 208

MATERIALS NEWS

For more data, circle item numbers you want on Reader Service Card.

206—Fuel oil additive is easy to use. Add to the fuel oil 1 gal. of Furnace Kleen for each 1000 gal. of fuel oil. It disperses. Maker says additive prevents tank corrosion, dissolves sludge, emulsifies moisture, cleans equipment, reduces smoke. *Solar Chemical Co.*

207—Floor coating primer, called Penntrowel Damp Surface Primer, makes it possible to install coatings on damp surfaces without long drying periods. Assures firm bond. *Corrosion Engineering Products Dept., Pennsalt Corp.*

208—Low-cost epoxy floor up to ¼ in. average depth can be installed for the approximate cost of a normal ⅛-in. deep surface. Polyrock is said to have great strength and wearability, plus liquid resistance. *Plant Maintenance, Inc.*

209—White butyl rubber alkyd compound is the base of this heat-reflective roof protector. Instead of acting as a paint film, White Top actually impregnates the roof and becomes a part of it, expanding and contracting with the roofing. *Superior Paint & Varnish Corp.*

210—Transparent rigid tubing is as clear as glass, yet has few of its mechanical or physical disadvantages. This butyrate "200" tubing can be drilled, sewed, tapped, turned, and cut. It's comparatively inert, can be used safely with many chemicals. *Busada Mfg. Corp.*

Turn the page

PPG Fiber Glass Pipe Insulation is slit lengthwise, slips easily on to pipe. Delaware Insulation Company installed 15,000 ft of PPG Pipe Insulation in the new Wilmington High School, reported excellent working characteristics.

"We can install PPG Fiber Glass Pipe Insulation 15% faster than other pipe insulating materials"

says Mr. Anthony Kotowski, foreman, Delaware Insulation Company, Wilmington, Delaware

"A good worker can insulate 200 feet of pipe in one work day. But with PPG Pipe Insulation, he can insulate 230 feet in the same amount of time," reports Mr. Kotowski. "This helps us maintain tight construction schedules and saves money, too!

"We like PPG Fiber Glass Pipe Insulation because it's flexible and workable. We bend it around pipe hangers, mold it to shape easily, smooth it, then fasten and bind it," continued Mr. Kotowski as he discussed the PPG installation in a Wilmington High School. "You can't do that with other insulations. They're too brittle, require cutting, and sometimes break when you're working with them.

"PPG Pipe Insulation is easy on the hands, and it's not attacked by rodents. Of all the insulations on the market, PPG gives the neatest, quickest job."

GET TOP RESULTS WITH PPG

Fast installation, excellent thermal insulation, long service life, low maintenance . . . all these advantages are yours with PPG Fiber Glass Pipe Insulation. It's available in a full range of sizes, with or without facing.

For full information, contact your nearest PPG Fiber Glass Sales Office, or write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

FIBER PPG GLASS

PITTSBURGH PLATE GLASS COMPANY

Sales Offices: Atlanta, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Houston, Kansas City, Louisville, Los Angeles, Miami, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis and Seattle.

For more facts Circle 539 on Reader Service Card

NEW from Metron

A LIGHT BUT RUGGED HAND TACHOMETER

Here are the features you asked for in Metron's new TRIPLETACH:

CONSTANT ACCURACY—± 1% full scale
THREE RANGES—changed with a flick of the switch
FOOL-PROOF READINGS—only the scale in use is visible
COMPACT SIZE—3½"x5⅝"x2½"; fits your toolbox
LIGHTWEIGHT—only 24 oz.
HANDY CASE—carry all accessories with you
VERSATILE—reads directly: shaft speeds in RPM; belt speeds in ft./min. or in./min.
ONE ROTATING PART—ball bearing-mounted; permanently lubricated.
Send today for Bulletin 103A and ordering information. Delivery: one week.

Metron

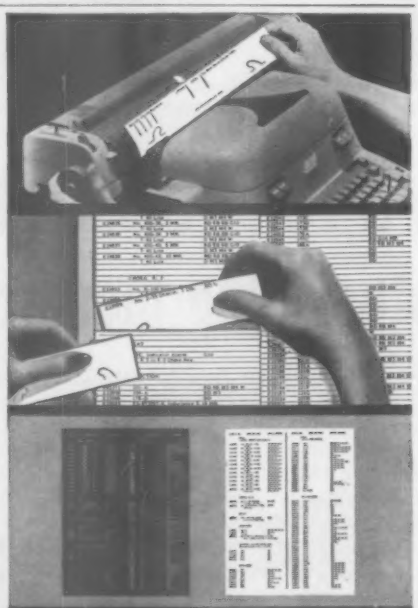
METRON INSTRUMENT CO.
5320 So. Delaware, Littleton, Colo. PY 8-2537 DDD: 303 TWX: DN 194

For more facts Circle 540 on Reader Service Card

type
each item change on a separate card

insert
. . . into your Acme photo panel

print
. . . your fresh new list with standard office duplicating equipment after photographing panels.



ACME VISIBLE

ACME PHOTO PANELS MAKE SHORT WORK OF LONG LISTS.

Maintain your own lists (parts, catalog, directory or index) . . . or let Acme do it for you. Send coupon today.

ACME VISIBLE RECORDS, INC.
3107 West Allview Drive, Crozet, Va.
Please give me information on Photo Panels for timesaving preparation of directories, catalogs, price and parts lists.

NAME_____TITLE_____
ADDRESS_____
CITY_____STATE_____

For more facts Circle 541 on Reader Service Card

Begins on page 208

MATERIALS NEWS

For more data, circle item numbers you want on Reader Service Card.

MATERIALS LITERATURE

211—Urethane hydraulic seals and packings are listed in 8-pager that features Disogrin, a urethane elastomer. Key factor in the success of these seals is a chamfered sealing lip for hydraulic and pneumatic equipment. *Disogrin Industries.*

212—Cleaning chemicals for ultrasonic equipment are covered in a comprehensive 14-pager (Bulletin S-700) describing dozens of cleaning agents. Includes basic data that give a good insight into the technology. *Branson Ultrasonic Corp.*

213—Steel products are the subject of this new catalog from the firm that pioneered the use of structural square columns. It gives details on triangular girder, Karri-More beams, pre-fab structures, etc. *Shlagro Steel Products.*

214—Corrosion-resistant tanks of Poxyglas are described in Bulletin 45-115. They're made by winding impregnated strands of glass filaments into a mandrel, then curing to form a hard homogeneous shell. *Black, Sivalls & Bryson, Inc.*

215—Plastic coating for metal, called Pfaudlon 301, is covered in 4-page bulletin describing this medium-priced corrosion-resistant sprayable coating. It has many applications in the process industries. *Pfaudler Permutit Inc.*

216—Color-coated stainless sheet and strip steel in 11 standard colors ranging from straw yellow to agate green to obsidian black is described in 4-pager that's entitled ColorRold. *Washington Steel Corp.*

217—Industrial rubber products—hundreds of them—are the subject of a 60-page catalog devoted to such categories as belting, hose, molded products, and rubber specialties. *Cincinnati Rubber Mfg. Co.*

MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

CASTERS HELP FEED ROBOTS

in first fully automated U.S. Post Office

The latest, most advanced mail-handling devices in the U. S. are at the new "automatic" Post Office in Providence, R.I.

But hard-working Postal employees *still* have to move mountains of mail to the machines—and deliver it after processing. And that's where Bassick casters come in.

Mail sacks move quickly and easily through the Providence Post Office on this Towveyor . . . on reliable Bassick "S99" swivel and "S98" rigid casters.

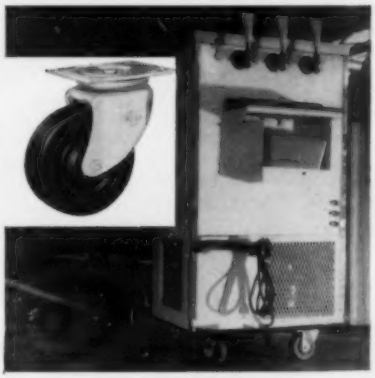
These heavy-duty casters are built to take the abuse of power-pulled applications at all Towveyor speeds. They come in 3″, 5″, 6″, 8″, and 10″ sizes with a broad selection of wheel types. Strong, extra-heavy-gauge steel. Ideal for dollies, assembly fixtures, and warehouse trucks as well as draglines.

SMOOTH ROLLING ROTOGRAVURE

One of the world's largest printing companies uses these special dollies to transport rotogravure cylinders safely to the presses. Featured here are Bassick "Floating Hub" casters—the casters with built-in shock absorbers. "Floating Hubs" eliminate bounce and caster shimmy, and aid in "climbing" over minor floor obstacles. They're ideal for handling a wide variety of delicate equipment and fragile products.

Blind Spot in History

Before Columbus, wheels—so important to modern life—were known only as toys, like this Aztec plaything, to the Indians of America. It was a thousand years after this toy was made before these early Americans used the "wheel" for practical purposes.



BASSICKS HELP BEAT THE HEAT HERE

This mobile beverage cooler and dispenser goes where it's needed on easy rolling, easy swiveling Bassick casters.

The Bassick "Qualecon" casters used here feature maximum caster quality at minimum cost. Recommended for hundreds of other medium-duty applications, too.

CAUGHT IN A "PROFIT-SQUEEZE"?

Switch to Bassick casters and cut a big slice out of materials-handling costs—said to amount to 30% in the average manufacturing plant.

You'll save on decreased maintenance for casters, equipment and floors. What's more, Bassick casters roll and swivel so easily they make a real hit with operating personnel.

THE MAN TO SEE

. . . is your distributor who carries Bassick casters. He has a wide range of caster sizes and types in stock for fast delivery. He can help you select the right caster for your job.

1.42

THE BASSICK COMPANY
BRIDGEPORT 5, CONN.
IN CANADA:
BELLEVILLE, ONT.

see our catalog in Sweet's or write for copy

Symbol of SW Excellence — Bassick — A DIVISION OF STEWART-WARNER CORPORATION

For more facts Circle 542 on Reader Service Card

This Hopper on your truck

CAN CUT HANDLING COSTS 50%

Here's the fastest, lowest cost method of handling bulk materials and small parts—hot or cold, wet or dry.

One man with a Roura Hopper can do the work of two and do it in half the time. Loaded Hopper is picked up by the truck operator in a matter of seconds. Platform or forks slip into underframe and it can't slip off.

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Loaded Hopper is transported to its destination—operator trips the latch—and the Hopper automatically dumps its load, rights itself, locks itself.

RIGHTS ITSELF

Thousands of Roura Hoppers are now in use handling scrap metal, hot forgings and castings, cinders and aggregate, pickles—and dozens of other items.

LOCKS ITSELF

They're made in eight sizes, ⅓ to 4 yards capacity. Built of 3/16" steel plate with continuous arc-welded seams. Heavier plate if desired, also stainless steel or galvanized. Mounted on live skids or with a choice of wheels. Can ship standard models immediately.

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BOOKS

Machine learning comes of age

There's new hope that we may be able to fulfill industry's near-insatiable appetite for highly skilled workers. It's called programmed learning and is one of the hottest subjects to stir up educational circles—industrial as well as academic—in years. As with most exciting new ideas, it has suffered agonizing distortion at the hands of numerous "popular" writers.

Inevitably, someone had to come along to clear the air of doubts, misconceptions, and nonsense. The Foundation for Research on Human Behavior has done this for the plant man with its easy-to-read yet informative *Programmed Learning*. The book is based on a seminar the Institute held in close cooperation with Eastman Kodak and IBM—who have both been engaged in programmed learning projects to meet their own internal training needs.

But this volume is more than a rehash of a seminar. It discusses future research needs; it offers eight samples and excerpts from programs now in use; it lists known programs and programmers; it catalogs present and possible manufacturers of teaching machines; and it tells who is publishing programs.

Among the most informative sections are these excerpts from a group discussion:

Q. Why hasn't industry used this technique (programmed learning) long before now?

A. In a recent survey I found out that in industry most psychologists are employed to do things other than training. Today people who have had some work in experimental psychology are beginning to work in training.

Q. What of teacher reaction to the teaching machine?

A. I have run into a lot of teachers who just hear the word "machine" and get scared. But after talking with school boards and several teacher groups, I think it's fair to say that those who understand how this is to be used are not in any sense disturbed by it. I don't see any organized group or any particular class of opposition.

These are the best informed men on this subject giving direct, lucid answers to the kind of questions that plant men are asking. (Reviewed by R. L. Grant)

Programmed Learning. The Foundation for Research on Human Behavior, 1141 East Catherine St., P.O. Box 1261, Ann Arbor, Mich. 180 pages. $3.

Graduate course for plant production men

Here is a comprehensive overview of production management in light of new techniques and developments. *Modern Production Management* is divided into three main segments: analytical methods in production management; the design of production systems; and the operation and control of these systems. While recognizing that successful production management involves an acquaintance with such specialties as human relations, organization, and general management, the author concentrates on "hard core" production concepts with heavy emphasis on the economics of production.

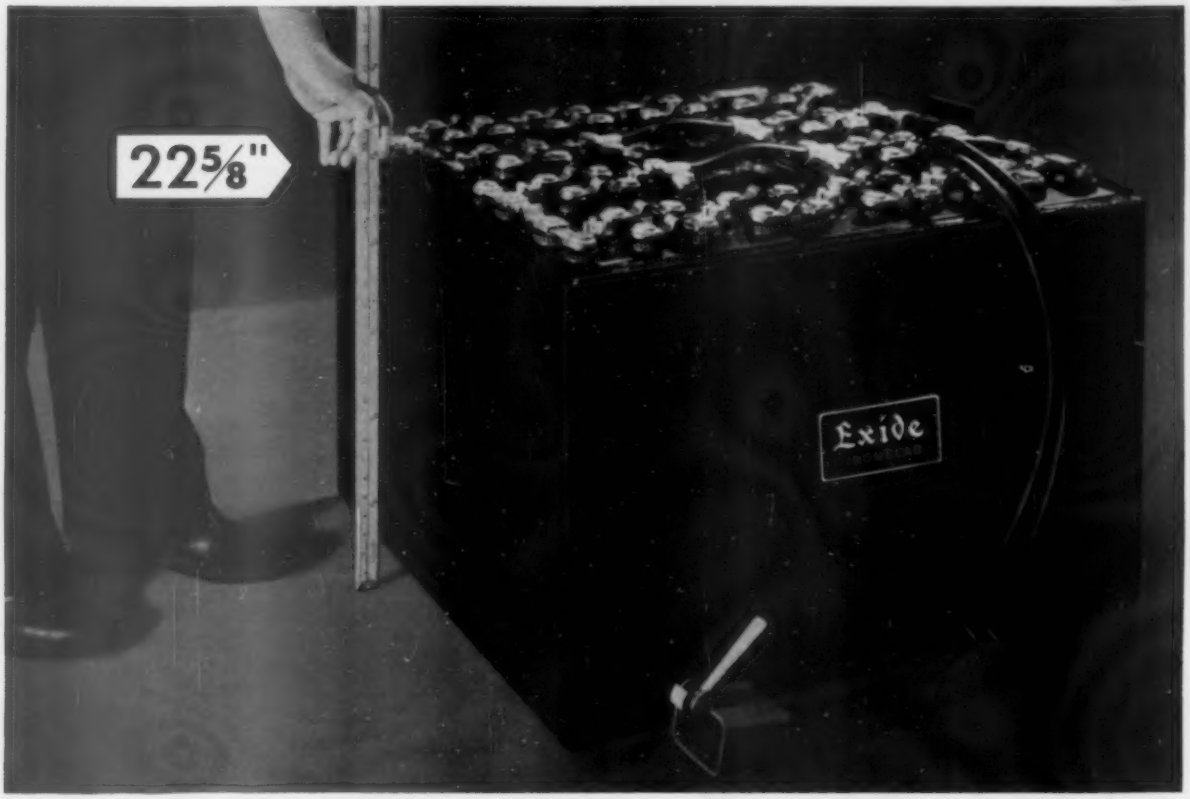
Without stressing mathematics, the book presents simulation, mathematical models, linear programming, and statistical analysis as practical management tools. More conventional techniques, such as graphic analysis, diagrams of work flow, and three-dimensional models of plant layout are also included.

Production processes, job and product design, and process planning are explained, and both the concepts and impact of computers, information systems, and automation are dealt with at length. Finally, the allied areas—maintenance, material handling, standards and work measurement, inventory control, quality control—are considered.

While designed as an undergraduate text, the book should be of real value to both the newcomer and the old hand working in the field. It cuts out a lot of the mystery

EXIDE POWER PACKAGE

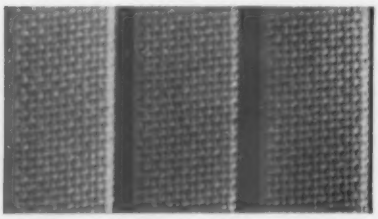
Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.



85 AMP-HR—ONLY 22⅝ in. HIGH!

Here's the new high in battery capacity for electric industrial trucks—the Exide-Ironclad TSC Battery. It is available right now and it will fit in the battery compartments of your present trucks without modification. It conforms to the design thinking for future trucks as expressed by truck manufacturers.

This battery offers a capacity of 85 amp-hr per positive plate—increased from the previous highest available capacity of 80 amp-hr in the Exide-Ironclad TGS—and still with over-all height of 22⅝ in. The length and width dimensions of the battery are also unchanged. Therefore the new battery occupies the same space as present batteries.



New tubing boosts battery capacity

Side view of tubing magnified twice size shows the fine mesh with thousands of pores for easy flow of electrolyte. Holds active material firmly against loss.

A unique feature of the Exide-Ironclad Battery is the tubular construction of the positive plates. With the square-shaped tube, introduced over a year ago in the TGS Battery, Exide made it possible to get higher capacity from each positive plate through greater area in contact with the electrolyte.

Now, in the TSC Battery, Exide introduces woven mesh tubing, still square shaped, but with higher porosity for easier access of electrolyte. This new tubing is able to hold more active material, which, in addition to the higher porosity, results in higher capacity than ever before. The tubing is of a special nonoxidizing material of proven long life in extensive laboratory tests and field applications.

This increase in battery capacity has been achieved without increasing the height of the battery. Thus you can step up the work capacity of your present trucks without the extra expense of modifying the battery compartments. The Exide-Ironclad TSC is still only 22⅝ in. high. Likewise its specific gravity is still only 1.275. Hence battery life potential remains high.

With the introduction of the Exide-Ironclad TSC, Exide now makes it possible for you to match your particular battery power requirements more closely than ever. If you are ready to buy a new truck or new battery now, talk with your Exide representative about how you can get the maximum power for your dollar.

Only Exide offers so broad a range of battery types: Exide-Ironclad, Exide-Powerclad premium flat plate, and Exide Nickel-iron alkaline (invented by Thomas A. Edison). Exide chargers are available in both motor-generator and silicon rectifier types, in sizes to cover all needs. Exide service men are coast to coast, all factory trained in both batteries and chargers.

Make sure you get maximum economy in your battery power. Write Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide®

For more facts Circle 544 on Reader Service Card

Begins on page 21t

BOOKS

about new developments, helps the production manager see his changing job in its true perspective. (Reviewed by Roger W. Christian)

Modern Production Management, by Elwood S. Buffa. John Wiley & Sons, Inc., 440 Park Avenue South, New York 16. 636 pages. $10.25.

* * *

Resistance Welding Manual (in two volumes) contains a comprehensive review of the entire process, including methods, materials, equipment, and standards. There are helpful appendices of definitions, symbols, and tables. While the manual emphasizes the practical side of resistance welding, it also contains useful information for the designer and engineer. Well-indexed.

Resistance Welding Manual (Volumes 1 and 2). Resistance Welder Manufacturers' Assn., 1900 Arch St., Philadelphia 3. 617 pages. $7.

Compressed Air and Gas Handbook offers a wealth of factual data on the subject—whether you're looking up large-capacity centrifugal compressors or checking multiple pneumatic tools, automatic feeds, and air gauging for a manufacturing process. There are sections on air economy, maintenance schedules, lubrication, starting up new compressors, and similar subjects. And there is an especially useful chapter on centralized versus multiple-unit compressed air systems.

Compressed Air and Gas Handbook. Compressed Air and Gas Institute, 55 Public Square, Cleveland 13. 592 pages. $8.

Personnel Administration, an old standby for many plant men, has been completely updated. The authors' approach, which stresses a point of view as well as a method, is enhanced by new cases, new chapters on labor relations, new material for small- and medium-sized firms, and renewed emphasis on the responsibility of plant management for personnel administration.

Personnel Administration, by Paul Pigors and Charles Myers. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. 749 pages. $7.95.

POWASERT
Nailers Help You
Slash Fastening Costs

Wherever there's a nailing job to be done Powasert® Automatic Nailers can bring new cost savings:

- Powasert uses either common or engineered bulk nails. They cost less, hold better, simplify inventory.
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- Powasert makes nailing your most productive operation. Five models for driving ½″ to 5″ nails in all kinds of wood, up to 800 nails from a single loading, driving speeds up to 120/minute.

Powasert can be money in the bank for you, too. For over five years, these Powasert features have helped companies double and triple production. Where there's volume nailing in boxing or crating, there too, is a profitable place for Powasert. Get facts and figures from your nearest United office or write direct. Powasert Department, United Shoe Machinery Corporation, Boston 7, Mass.

United
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The Automatic Word to Fastening Speed and Savings

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Now! Skil Roto-Hammers drill 3½" holes in reinforced concrete

using new percussion carbide tipped Skil Core Bits!

There are plenty of good reasons why the Skil Roto-Hammer is sure to be the world's largest selling hammer again in 1961! But one of the foremost is Skil's new core bits.

These hollow core, percussion type carbide bits increase the range of the Model 726 Roto-Hammer from 1⅛" up to 1½" and the Model 736 from 2" up to a full 3½"!

What's more, they drill right through stubborn steel reinforcing rods—an impossibility with solid carbide bits or star drills.

This means that the hammer that already drills masonry holes at the *lowest cost per hole* and with *lowest hammer maintenance*, has tremendous added versatility.

Ask your Skil distributor for a demonstration soon. Look under "Tools-Electric" in the Yellow Pages. Or write: Skil Corporation, Dept. 117G, 5033 Elston Avenue, Chicago 30, Illinois.

Skil Roto-Hammers combine power rotation with powerful hammering to drill holes in masonry (¼" to 3½") 5 to 6 times faster than ordinary electric hammers! Lowest maintenance—no springs to break.

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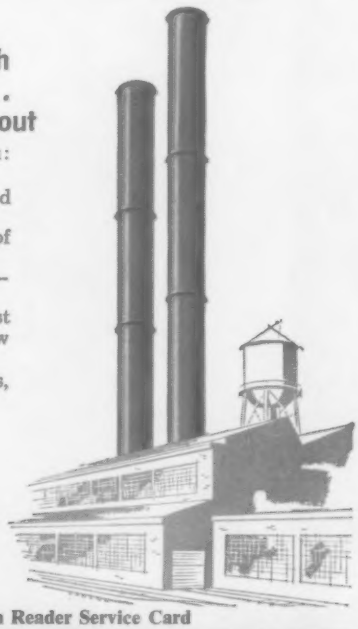
For bulletin containing all the facts, write Dept. CE-40.



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FILMS

Curtain Time dramatizes the use of steel curtain walls that are versatile and adaptable to practically all types of buildings. Cartoon-like figures demonstrate some of the experiences and problems encountered in industrial building. The film shows curtain wall in stainless steel and porcelain-enameled steel, and emphasizes its beauty and durability, also the ease with which these walls can be erected. 16mm, color, sound, 15 min. For loan, write to:

United States Steel Corp., Film Distribution Center, 525 William Penn Place, Pittsburgh 30.

Hard to Handle traces the development of equipment to meter and pump liquids that are difficult to handle accurately without leakage or contamination. Shows how current metering problems are solved in chemical plants, utilities, steel plants, paper mills, and research laboratories. Also shown are installation procedures and maintenance of metering units. 16mm, color, sound, 31 min. For loan, write to:

Lapp Insulator Co., Process Equipment Div., 125 Hall St., Le-Roy, New York.

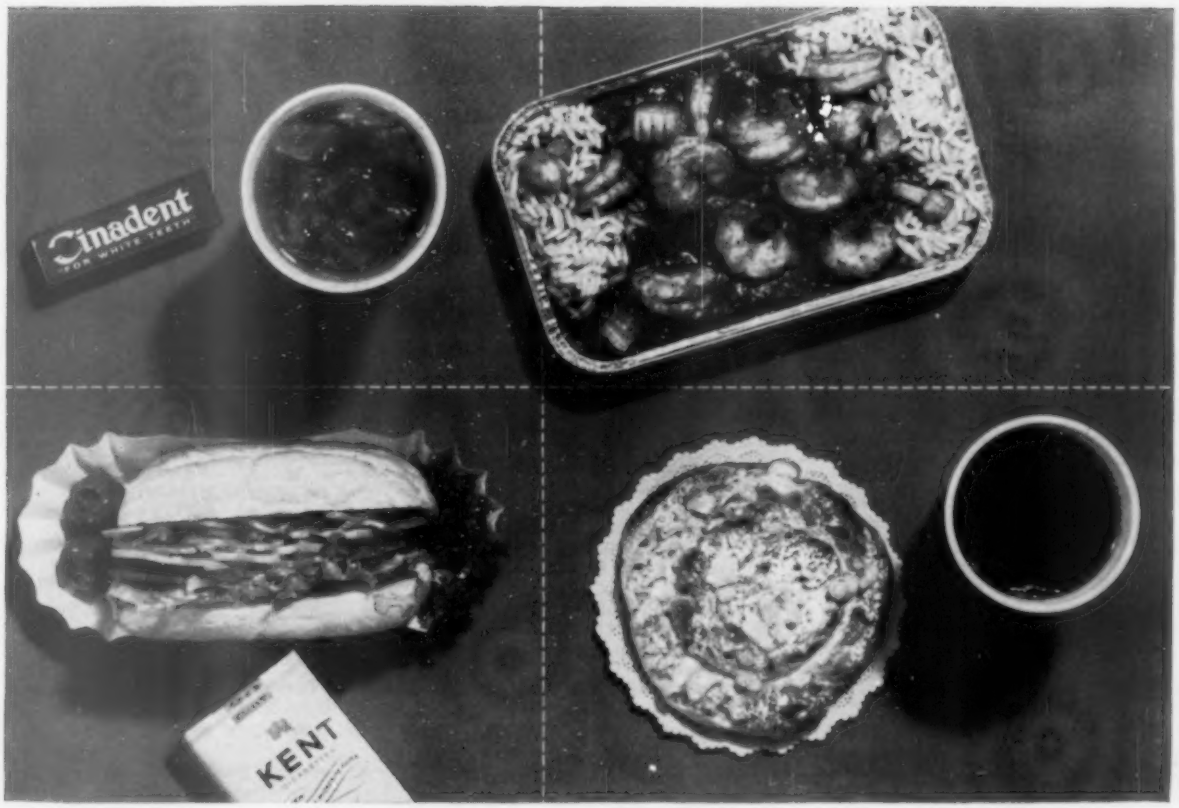
BIO-PAC . . . Big City Sewage Processing for Small Capacity Needs shows how a compact plant can give big city sewage processing to areas that lack municipal facilities. The animated film demonstrates new single-unit sewage treatment plants with capacities to serve from 50 to 500 people. Applications illustrate system's effectiveness and dependability for areas with small-capacity needs. 16mm, color, sound, 10 min. For loan, write to:

Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1.

1961 Supplement to the 1960 Catalog of Educational Motion Pictures lists 650 new film titles covering subjects in the scientific and educational fields. Includes corrections to the 1960 catalog such as revised subject headings and classifications. Provides rental details, etc. For copy, write to:

Audio-Visual Center, Circulation Dept., Indiana University, Bloomington, Ind.

FOOD FOR THOUGHT



Off-hour eating can be profitable

Canteen food service is on duty 24 hours a day—saves money, too

Staggered lunch periods, coffee breaks, snack times, multiple-shift operations: all cause considerable problems for executives in charge of food service in plants, schools and institutions.

But not for the executive who installs Canteen® *automatic* food service.

Canteen vendors supply hot food, hot and cold drinks, soups, salads, sandwiches, pastries — snacks and candy—any hour of the day or night.

Everyone benefits from Canteen food service. Personnel gets food which is realistically priced, in the shortest possible time, without waiting in line. They can get service around the clock, if that's necessary.

Canteen service also cuts food service costs — saves space, saves man-hours, *saves money*.

Canteen, largest, most experienced company in the field of automatic food vending, tailors food service to fit *your* requirements; serves the kinds of foods your people prefer; fits the space you have in mind.

For a single, reliable and economical source of high-quality foods and beverages, automatically served, call your local Canteen representative. You'll find his name in the Yellow Pages of your telephone directory. Or mail the coupon for further information.

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AUTOMATIC CANTEEN COMPANY OF AMERICA

NEW! *This Canteen All-Purpose Merchandiser serves 130 items, from an orange to a sandwich to a piece of cake. Ideal for supplementary feeding.*

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AUTOMATIC CANTEEN COMPANY OF AMERICA
Merchandise Mart Plaza
Chicago 54, Illinois

Gentlemen: I'm interested in knowing what Canteen automated food service can do for us. Please send complete information.

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Address_____

City_____ Zone____ State_____

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ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month for this issue. For items you want, circle numbers on Reader Service Card.

MAINTENANCE

275—Paint. "Slide guide" contains complete data on selection of proper paints. Barreled Sunlight Paint Co.

276—Waterproofing materials. Ask for specification guide to 21 products. Standard Dry Wall Products, Inc.

277—Vacuum system. Catalog 155B, "Spencer Vacuum," on central vacuum-cleaning system. Spencer Turbine Co.

278—Drain cleaner. Complete information on one-man powered drain cleaning machine. Kollmann Mfg. Co., Inc.

279—Machine mounts. Literature on Level-Rite Series "500" mounts—fast, precise. Unisorb Div., The Felters Co.

280—Waterproofing materials. Engineering data sheets on asphalt emulsions and cutbacks. The Flintkote Co.

281—Scaffolds. Want circulars on stairway, span-type, Tallescope aluminum scaffolds? Up-Right Scaffolds.

MATERIAL HANDLING

282—Overhead conveyors. Report RK-13 tells about systems for handling empty containers. Rapistan-Keystone, Inc.

283—Wire rope, slings. Handbook "Tuffy Tips" on how to get longer service. Union Wire Rope, Armco Steel Corp.

284—Wire rope slings. Handbook contains helpful data on selection and use. Union Wire Rope, Armco Steel Corp.

285—Cranes. Bulletin on job-mated cranes to help cut costs in your plant. Shepard Niles Crane & Hoist Corp.

286—Shelving/lockers. Booklet, "12 Losses Penco Planning Can Control." Penco Div., Alan Wood Steel Co.

287—Tote boxes. Details on rectangular boxes—popular sizes with dollies to fit. Wear-Ever Aluminum, Inc.

288—Stackers. Photo report No. 108 shows versatility of fork-lift stacker. Louden Machinery Co.

289—Steel shelving. Fact-packed catalog on rapidly assembled shelving. No bolts needed. Borroughs Mfg. Co.

290—Lifts. Catalog RE-203 on oil-hydraulic powered lifts. Capacities 6,000 and 12,000 lbs. Rotary Lift Co.

291—Self-dumping hoppers. Booklet tells how to cut handling costs by 50%. Eight sizes. Roura Iron Works, Inc.

292—Lift trucks. Literature on exclusive foot-controlled feature for driving and hoisting. Hyster Co.

293—Steel tote boxes. Here's information on steel boxes for towing or lift trucks. Republic Steel Corp.

294—Pallet racks. Complete details on space-saving, simplified stacking racks. Republic Steel Corp.

295—Tractor-shovels. Bulletin "Industrial Material Handling from A to Z"—for the asking. Frank G. Hough Co.

296—Wire rope. Booklet describes structural features, applications. Wire Rope Div., John A. Roebling's Sons.

297—Hoists. Bulletin H-20 gives full facts on versatile zip-lift hoist with two brakes. Harnischfeger Corp.

298—Walkie trucks. "Transporter Facts" and "Industrial Truck Selector Guide." Automatic Transportation Co.

299—Tramrail/Crane systems. Booklet No. 2008 contains full data on overhead cranes. Cleveland Tramrail Div.

300—Dock boards. Bulletin DB-204 to help spot and correct high-cost dock loading problems. Magline, Inc.

PLANT SITES

301—Toledo, Ohio. All about plant location facilities in Toledo-Northwestern Ohio area. Toledo Edison Co.

302—Ohio. Two booklets, "Statistical Abstract of Ohio: 1960" and "Ohio, The Growth State." State of Ohio.

303—Nebraska. Data on manufacturers' production capacities in Northern Plains States. Northern Natural Gas Co.

ELECTRICAL

304—Motor controls. Full information on complete line, features of magnetic controls. Furnas Electric Co.

305—Control cable. Booklet describes one standard cable for multi-conductor jobs. Rome Cable Div. of Alcoa.

306—Electrical maintenance. New booklet "Maintenance Modernization Means Profits." Westinghouse Electric Corp.

307—Electrical connectors. Bulletin F52 has data on molded-to-cable connectors. Electrical Products Div., Joy.

308—Manual starters. Bulletin 2510 B-C on NEMA sizes 0 and 1; 2-, 3-, and 4-pole construction. Square D Co.

309—Motor starters. Publication GEA-7326 covers new 100-line sizes 3 and 4 starters. General Electric Co.

310—Metallic tubing. Information on electrical metallic tubing for future power demands. Republic Steel Corp.

311—Pushbuttons. Publication LO-104 shows complete line oiltight pushbuttons. Six colors. Cutler-Hammer, Inc.

312—Fuses. Bulletin FIS on dual-element fuses for loads 0 to 600 amperes. Bussmann Mfg. Div., McGraw-Edison Co.

313—Fuses. Book HCS on high-capacity fuses for loads above 600 amperes. Bussmann Mfg. Div., McGraw-Edison Co.

314—Motors. "The Fine Art of Building Better Motors" yours for the asking. Crocker-Wheeler Div., Elliott Co.

315—Tachometer. Bulletin 103A on compact, versatile instrument. One rotating part. Metron Instrument Co.

PRODUCTION

316—Pneumatic conveying. Catalog 143-B covers dual-purpose conveying and cleaning system. Spencer Turbine Co.

317—Speed reducers. Book 2824 tells about universal worm gear speed reducers with 3-way mounting. Link-Belt Co.

318—Spraying machines. Brochure gives details on automatic spray finishing machines. Conforming Matrix Corp.

319—Metal lathes. Catalog describes features of accurate, versatile, low-cost machines. Rockwell Mfg. Co.

320—Rivitors/Clinchors. Bulletin 555 and 646 provide data on Rivitors and Clinchors. Tomkins-Johnson.

321—Safety trip control. Catalog 65 gives facts on trip control unit for safety. Micro Switch Div., Honeywell.

322—Dihedral couplings. Data shows wide range of angular and offset capacities. Ajax Flexible Coupling Co.

323—Sealant compound. Brochure IA-200 on polysulfide polymer as a sealant and adhesive. Thiokol Chemical Corp.

324—Hand, power tools. Handy 128-page catalog identifies types by number for easy ordering. Snap-On Tools.

325—Visible panels. Booklet tells how they save time in preparing catalogs, etc. Acme Visible Records, Inc.

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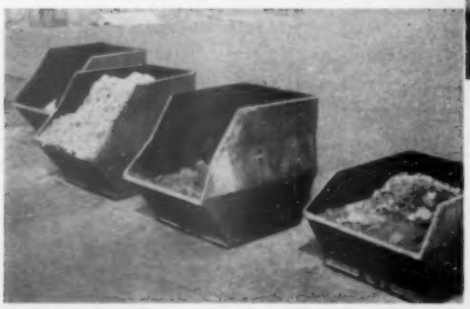
HEIL LOAD LUGGER®

saves waiting time, double handling of waste at Johns-Manville plant...

Improved Housekeeping — Scrap and waste generated from the manufacture of Rock Wool insulation formerly was dumped into an open pit . . . and then loaded into trucks. Now it's dumped directly into a LOAD LUGGER detachable container. When filled, container is picked up automatically by a LOAD LUGGER truck . . . hauled to dump and returned. Plant area is always neat and clean. Good housekeeping, with refuse collected in container, also contributes to safety.

No Double Handling — Here a filled container is about to be picked up by the LOAD LUGGER. Driver simply attaches hoist chains and automatically lifts container aboard. No waiting to be loaded by a clamshell — no tying up equipment and man power — no double handling of waste.



Highly Flexible Operation — The 17 containers of various sizes and types are spotted in strategic positions on a two-acre rectangle around production building of Johns-Manville's Alexandria plant. They are easily loaded by cart, conveyor, front-end loader or clamshell. Picture shows an inplant trucker dumping a two-yard container into a six-yard LOAD LUGGER container.

•

LOAD LUGGER Systems are available for all types of industries — containers up to 16-cu-yd capacities — open- and closed-type. Write for name of your nearest dealer — get the cost-cutting story now.

One Truck, One Driver reduces truck and labor costs. LOAD LUGGER at disposal grounds dumps contents cleanly and quickly . . . returns empty and picks up another loaded container. Repeats process all day — never any waiting. Result: more efficiency . . . lower disposal costs because a single truck and one driver does the work of many. Besides waste, LOAD LUGGER System also handles raw materials such as slag and coke.

THE HEIL CO.
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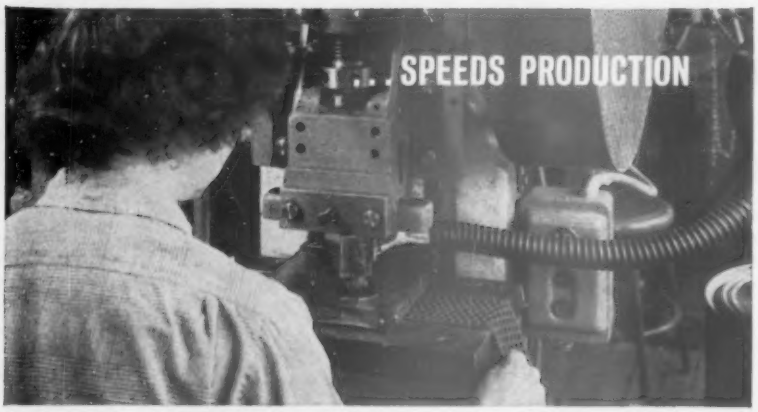
Factories: Milwaukee, Wis. • Hillside, N. J.; Lancaster, Pa.; Cleveland, Ohio; Modesto, Calif.

LOAD LUGGER and HUGE HAUL SYSTEMS

Sales Offices: Hillside, N. J.; Washington, D. C.; Atlanta, Ga.; Cleveland, Ohio; Chicago, Ill.; Milwaukee, Wis.; Kansas City, Mo.; Denver, Colo.; Dallas, Texas; Los Angeles, Calif.; Seattle, Wash.

Here, DOUBLE DUTY Use of a SPENCER VACUUM SYSTEM



At Charles W. House & Sons, Inc., Unionville, Connecticut, a single Spencer vacuum system contributes to plant efficiency and operating economy in two important ways, by:

SPEEDING PRODUCTION—At the machines where washers are stamped from felt strip, vacuum picks up the washers, conveys them to containers and carries off the fuzz and dust—leaving washers **clean.**

SIMPLIFYING MAINTENANCE—Cleaning is quick and thorough with Spencer vacuum. And because dirt and litter is carried off through an enclosed piping system, there's no hazardous, unhealthful recirculation of dust or lint.

For a no-obligation analysis and suggestions on how Spencer vacuum may be able to meet **your** production, conveying or maintenance needs, write outlining your particular problems.

Request Catalogs No. 155B "Spencer Vacuum", and No. 143-B "Pneumatic Conveying".

The **SPENCER** TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For more facts Circle 551 on Reader Service Card

Begins on page 222

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month for this issue. For items you want, use Reader Service Card.

326—Air-power devices. Spot-A-Mation idea file gives complete data, wiring diagrams, etc. Bellows-Valvair.

327—Lubricating equipment. Catalog lists line of electric, air- or hand-operated units. Alemite Div., S-W Corp.

328—Schedule boards. Booklet X-200 (24 pages) shows applications of visual control boards. Graphic Systems.

329—Paint remover. Details on compound for removing paint on production rejects. Gunk Laboratories, Inc.

330—Industrial TV. Write for copy of closed-circuit TV system-planning guide. Gives applications. Philco Corp.

331—Data processing. Case histories show application of system for plant control problems. Royal McBee Corp.

332—Schedule board. This guide to control methods has full-scale chart section. Conley, Baltzer & Steward.

PACKAGING & SHIPPING

333—Strapping machines/tools. Here's information on maker's line for every operation. Signode Steel Strapping Co.

334—Rust preventives. Two helpful charts give industrial and government specifications. Valvoline Oil Co.

PLANT SERVICES

335—Air conditioning. Ask for cost formula and data on maker's system. Typhoon Air Conditioning Div.

336—Plant protection. Booklet describes burglar and fire alarm service. American District Telegraph Co.

337—Compressor. Bulletin 185 tells about Balanced/Opposed motor-driven line; 75-8000 bhp. Clark Bros. Co.

338—Water coolers. Free illustrated booklet details maker's complete line of coolers. The Ebco Mfg. Co.

339—Steel equipment. Catalog 100 K (100 pages) describes diversified line. Lyon Metal Products, Inc.

340—Storage cabinets. Complete information on new 800 series line of steel cabinets. Columbia-Hallowell Div., SPS.

341—Air conditioning. Booklet 518 has data on complete line of component products. American Air Filter Co.

Turn the page

Send for your file of Flintkote engineering data sheets for your answers to waterproofing, dampproofing, corrosion proofing or insulation coating problems!

Many Flintkote asphalt emulsions and cutbacks are specially designed and field proven for protecting metal, masonry and insulation against water, dampness and corrosion under most severe conditions, among them:

C-13-E EMULSION: – Non-fibrated asphalt base clay emulsion protects metal and masonry from weather, water and corrosive elements.

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FLINTKOTE C-19: – A tough vapor sealing asphalt cutback, spray-applied for protection of low temperature equipment.

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The Flintkote Company,
30 Rockefeller Plaza, N.Y. 20, N.Y.

FLINTKOTE®

America's Broadest Line of Building Products

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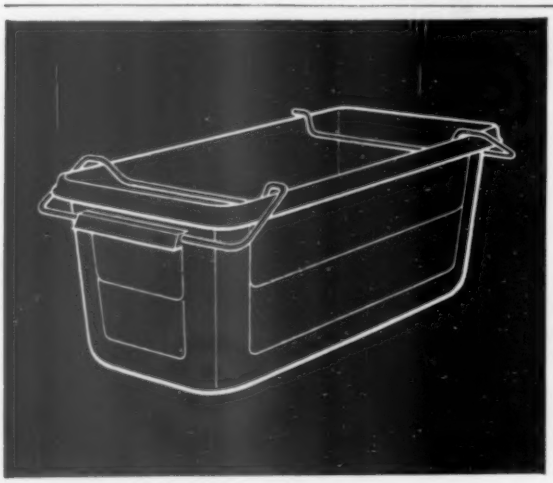

Let wear-ever store it

Common-sense design, that's where Wear-Ever shines. For example, Wear-Ever makes tote boxes with special handles that permit stacking when full–nesting when empty. After that you have Wear-Ever's superior construction going for you. Extra-heavy-gauge aluminum alloy, no seams to catch parts (or dirt). Wear-Ever stocks popular sizes with dollies to fit–for immediate delivery. Send reply card for full details on these and other rectangular containers; or write Wear-Ever Aluminum, Inc., New Kensington, Pa.

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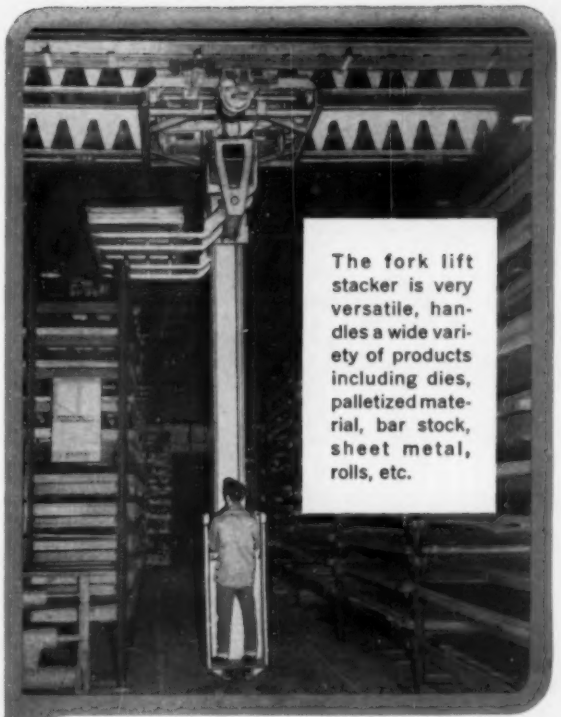
The fork lift stacker is very versatile, handles a wide variety of products including dies, palletized material, bar stock, sheet metal, rolls, etc.

Cut Costs...Save Space

Louden stacks higher with safety

Operational in the narrowest aisles, Louden Stackers conserve floor space making possible maximum utilization of storage area. And, they provide selective storage for a variety of materials so that each is immediately available.

An important design feature insures safe operation of Louden Stackers at all times. As a load approaches the upper limit, it is closest to the frame from which it is suspended. Thus, where the stacking height becomes hazardous for conventional floor operated equipment, the entire Louden Stacker assembly is at its most stable condition.

When you have material handling requirements, call on Louden, the pioneer of overhead handling. Benefit by Louden's unequaled experience and broad array of service-proven equipment. Most Louden installations pay for themselves in months; some have done so in a matter of weeks.

Write today for PHOTO REPORT NO. 108... a variety of examples of Louden Stackers at work.

Louden
MONORAIL & CRANES

THE LOUDEN MACHINERY COMPANY
715 Broadway, Fairfield, Iowa
A Subsidiary of Mechanical Handling Systems Inc.
Plants in Fairfield, Iowa and Clark, New Jersey
SINCE 1867...THE FIRST NAME IN MATERIALS HANDLING

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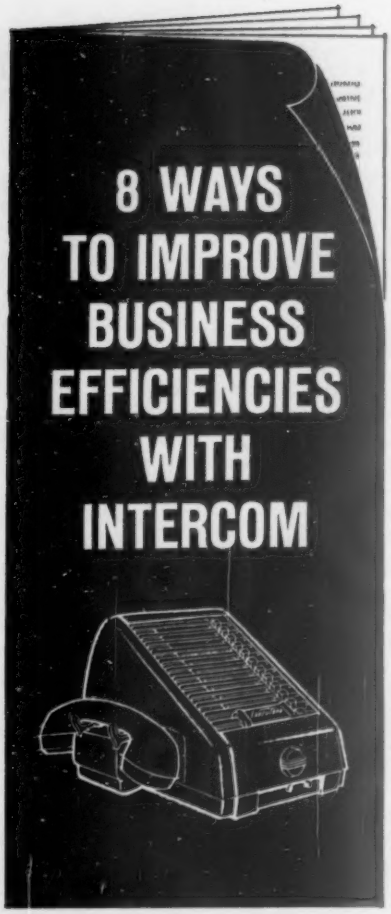

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Begins on page 222

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month for this issue. For items you want, use Reader Service Card.

342—Wire partitions. Bulletin P-55 lists standard sections in variety of sizes. Wire & Iron Products, Inc.

343—Dust collector. Literature gives complete data on Multiclone mechanical collector. Western Precipitation.

344—Couplings. Packer Usage Guide has information on correct choice of couplings for fluids. Snap-Tite, Inc.

345—Dust collector. Literature describes features of new automatic dust collector. Torit Mfg. Co.

346—Food dispenser. Here's information on automated food serving equipment. Automatic Canteen Co. of America.

347—Fans. Catalog gives data on new space-saving Centriline fans. Sturtevant Div., Westinghouse Electric Corp.

348—Intercom system. Free booklet gives all the facts on how to improve business efficiency. Executone.

349—Safety glasses. Bulletin S-1013 covers new "Durasafe" glasses in choice of colors. American Optical Co.

350—Steel lockers. Literature presents lockers in wide range of sizes and styles. Republic Steel Corp.

351—Measuring tapes. Folder 5807 introduces 6- and 12-ft. tapes in holsters with belt clips. Evans Rule Co.

BUILDING

352—Floor surfacer. Complete information on resilient Portland cement-latex mixture. Pennsalt Chemicals Corp.

353—Grating. New catalog describes safety features of fireproof Grip Strut grating. The Globe Co.

354—Plastic panels. Glazing Folder SL-1 tells advantages and provides glazing details. Structoglas, Inc.

355—Floor grating. Easy-to-use steel grating catalog gives complete facts, applications. Kerrigan Iron Works Co.

356—Smokestacks. Bulletin contains details on glass-protected stacks in varied colors. A. O. Smith Corp.

357—Multi-plate pipe. Catalog gives specifications and describes adaptability. Armco Drainage & Metal Products, Inc.

358—Doors. All about Rubbair doors for ease in handling movement of merchandise. Stic-Klip Mfg. Co., Inc.

SOURCES OF SUPPLY

Suppliers and sub-contractors in the Northern Plains can be pinpointed quickly by the Facilities Register, a unique electronic index of production facilities. Whether yours is a problem of finding new suppliers, contracting for idle machine time, shortening lines of supply, or obtaining better quality and service:

NORTHERN NATURAL GAS COMPANY
SERVING THE NORTHERN PLAINS ☐ GENERAL OFFICES: OMAHA, NEBRASKA
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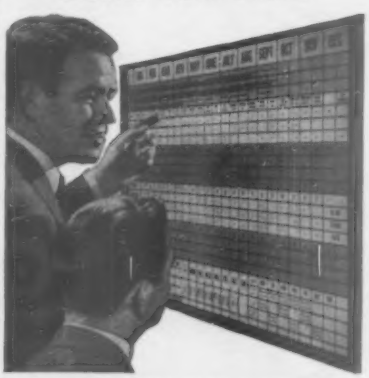
How To Get Things Done Better And Faster



BOARDMASTER VISUAL CONTROL

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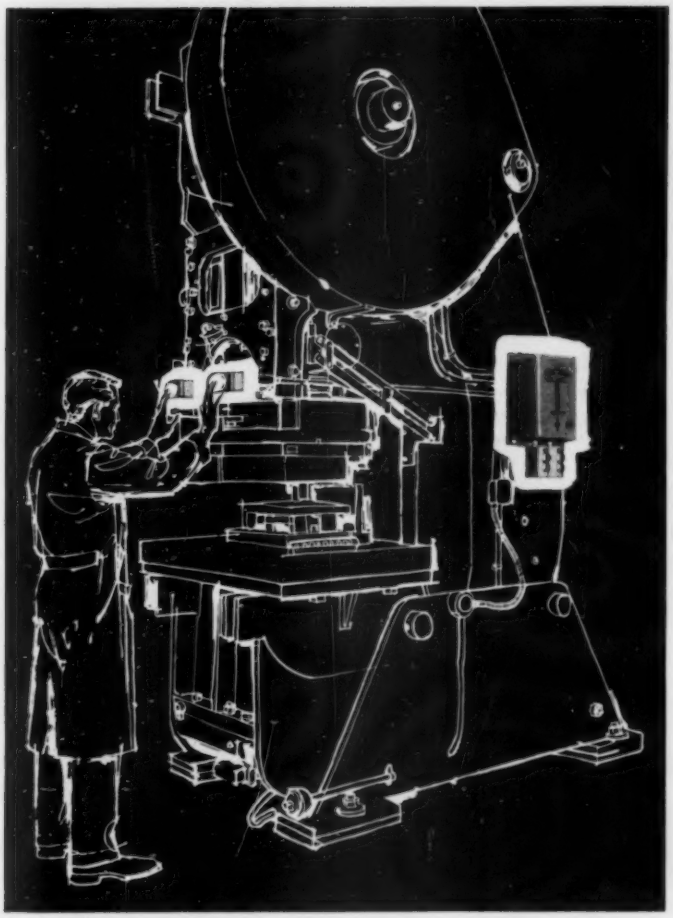


DO YOUR PUNCH PRESSES REALLY MEET THE SAFETY CODES?

It's a shock to find that virtually all conventional machine controls fail to truly meet the non-tie-down specifications. Most are designed so that when a stroke is interrupted, it can later proceed unexpectedly. And, that's the stroke that can maim or kill!

Recently an accident occurred on a friction clutch press which a conscientious management had fully equipped with 2-hand controls and the so-called one-stroke or anti-repeat feature. After the costly loss the company began asking itself how the accident happened on a machine they thought was completely safe. They carefully reenacted the sequence and found that the operator had interrupted the stroke by taking his right hand off its control and then attempted to straighten the material in the danger zone. In doing so he inadvertently touched the control with his shoulder and because he still had his left hand on the other control the machine completed the stroke, seriously maiming his hand.

They found an answer . . .

The company found the answer in a MICRO SWITCH Trip Control unit that was quickly and easily mounted on the machines. An exclusive "can't cheat" feature prevented the dangerous possibility of the operator tying down or wedging one switch and operating the control with one hand. Resumption of the stroke, as in the accident situation, could not occur without the operator taking both hands off the controls and then intentionally touching both simultaneously (or *all* control switches on machines with more than one operator). A unique "fail-safe" feature prevented accidental actuation of the clutch that might have been caused by any faulty or damaged component in the system.

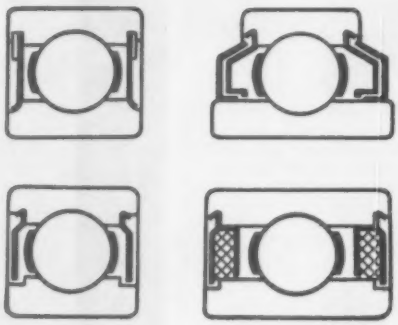
On new installations . . . production increases!

When MICRO SWITCH Trip Controls are installed to electrically modernize machines, production increases because operators experience less fatigue actuating the low-force electric switches and a fast work rhythm soon becomes natural due to the smooth, two-hand operation. Instant electric clutch actuation also eliminates "lag" between operator action and machine action.

MICRO SWITCH Trip Controls are approved and/or recommended by many states including: New York, Pennsylvania, California and Wisconsin. Packaged kits are available to fit virtually all hand-operated machines and the units start as low as $60.00. See your MICRO SWITCH Distributor listed in the Yellow Pages or write for Catalog 65. MICRO SWITCH . . . Freeport, Illinois, a division of Honeywell. In Canada: Honeywell Controls, Limited, Toronto 17, Ontario.

Here's one good reason for replacing with FAFNIR BALL BEARINGS

Dirt, moisture, steam, fumes, acids . . . Fafnir has sealed or shielded ball bearings to protect against them. In this all-inclusive line are bearings designed to operate at any speed and in any contaminant. If short bearing life is your problem, there's a Fafnir Ball Bearing to solve it.



...and here's another...your Authorized Fafnir Distributor

Your Authorized Fafnir Distributor has everything you need in ball bearings . . . all types, all sizes, for all purposes. And he's ready to help — day or night — when you need bearings in a hurry!

For job-perfect replacements . . . for top-flight service . . . for sound advice on bearing problems, . . . call your Authorized Fafnir Distributor. Like you . . . he is paying his share of U. S. taxes. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS

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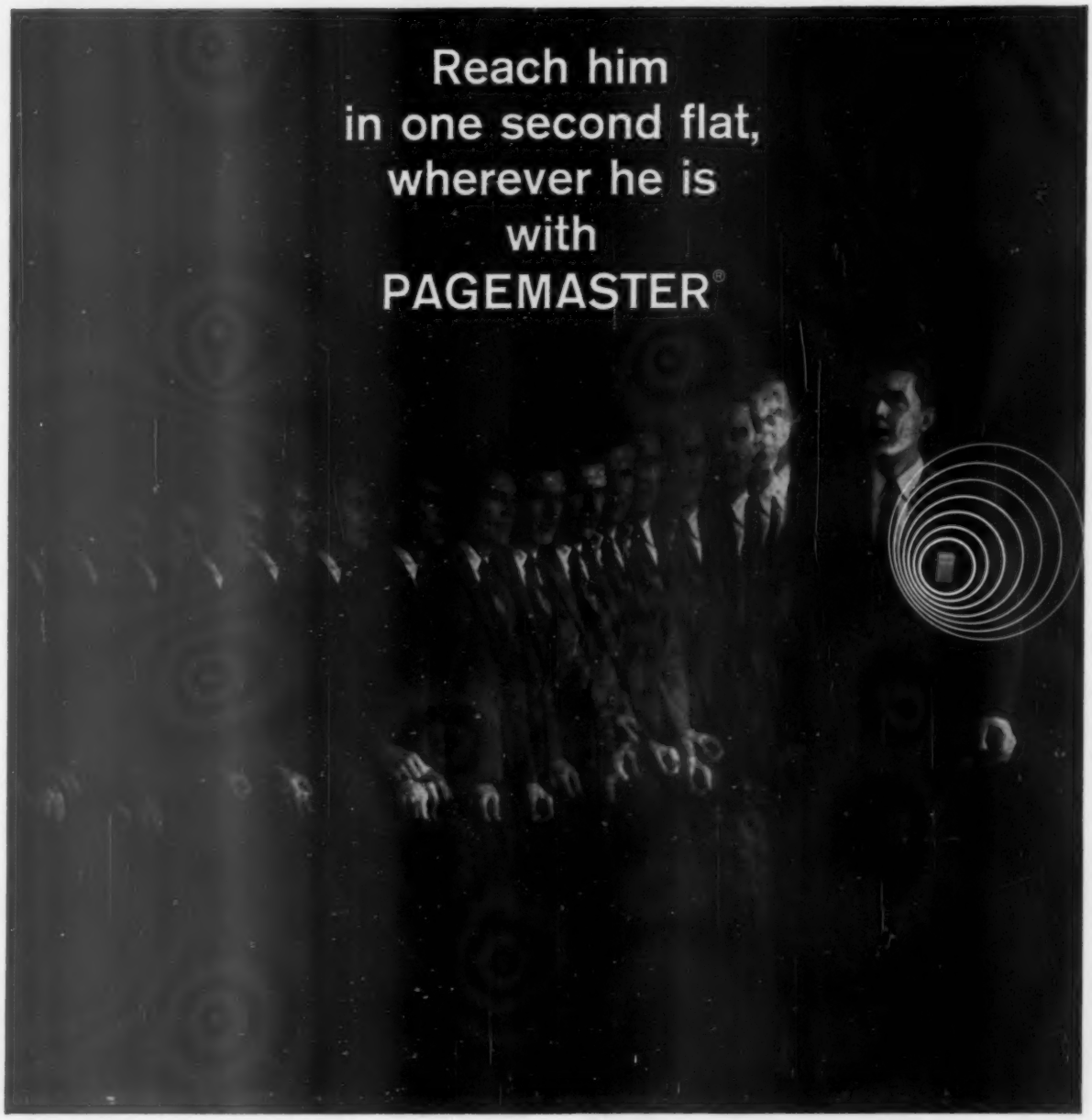

Find him instantly—in the stockroom, at the other end of the factory, even out of doors—way beyond the range of conventional paging systems.

Alert him—and only him. His—and only his—pocket-sized PAGEMASTER will beep discreetly. And will sound, again and again until he checks in. For PAGEMASTER is gentle but insistent.

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Want to see how much faster and how much more economically PAGEMASTER reaches key people . . . to help them get things done? Your STROMBERG-CARLSON® Communications Consultant has the irrefutable facts. For his name, call Western Union Operator 25, or write:

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In modern business communications...THERE IS NOTHING FINER THAN A STROMBERG-CARLSON®

DRAWING BOARD NEWS No. 4

Published by Chart-Pak, Inc., originator of the tape method of drafting

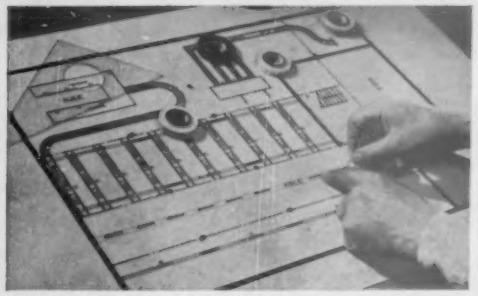

CHART-PAK TAPES LIGHTEN THE LOAD OF OVERWORKED DRAFTSMEN

Chart-Pak is good news for designers and draftsmen. It cuts down on routine "pencil pushing." It allows more time for really creative work.

Lines, bars, shapes, patterns and symbols are all pre-drawn. With Chart-Pak, they come on pressure sensitive tapes and sheets. They just *press* down . . . quickly, neatly.

Even curved lines, as small as ¼" wide can be "taped on." And Chart-Pak is "goof-proof." It is easily removed for corrections . . . yet won't come off accidentally.

NEW TAPES FOR BETTER PHOTOGRAPHY

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Chart-Pak helps Budd Company keep track of costs, operations

Charts of important variables in four Budd plants are kept up to the minute the easy way — with Chart-Pak Materials.

Popular everywhere . . . Many leaders of American industry use Chart-Pak Materials extensively. For example: American Bosch Arma; American Cyanamid Company; Grumman Aircraft; Florida Power & Light; Kaiser Aluminum and Chemical Corp.; Michigan Bell Telephone; Smith, Kline, & French Laboratories; Union Carbide; Western Electric; plus many, many more.

NEW! "TAPE-SAVER" PACKAGE

WRITE FOR FREE CATALOG OF Chart-Pak pressure-sensitive materials. It's powerful "medicine" for overworked draftsmen!

CHART-PAK, INC.

ORIGINATOR OF THE TAPE METHOD OF DRAFTING

103 RIVER ROAD, LEEDS, MASSACHUSETTS

Dealers in principal cities in U. S. and Canada

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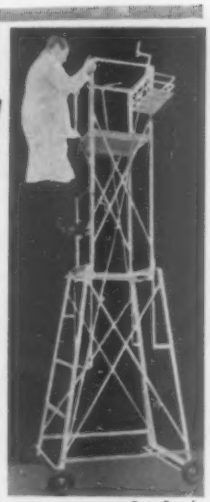
He propels "MOVE-ON" along without climbing down



As soon as the man on the platform has finished one job, he can WITHOUT CLIMBING DOWN, propel "MOVE-ON" to the next, no matter whether it is in front, behind, or even around a corner. Ideal and economically priced for decorators, electricians, cleaning and maintenance men and all other overhead workers.

Pat. Pend.

SELF-PROPELLED STAGING

For quicker, safer, cheaper overhead work

Two Models Are Available:

MODEL "B" (Illustrated) gives working heights up to 16 ft.
MODEL "A" gives working heights up to 11 ft.

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DEPT. C—P.O. BOX 763

METAIRIE, LOUISIANA

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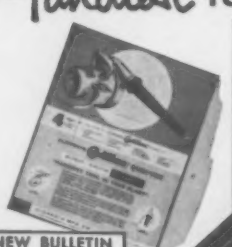

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NOW

New 12B2R Inline Screw Driver.

new, powerful, lightweight line of reversible air tools

Here's a new line of handy, lightweight, *reversible* air tools from Gardner-Denver—designed to keep your production lines moving at top efficiency. Screw drivers, nut setters—inline and angle types—are available with a complete selection of interchangeable attachments.

Powerful air motor. It's the motor that makes the big difference in these tools. Compact design houses more power, higher speed . . . provides lighter weight, lower noise level than ever before.

Reversibility. Saves valuable man-hours—assures accurate driving and setting—prevents sending assemblies to repair stations. Permits tightening both right- and left-hand threaded fasteners. Entire line also available in non-reversible models.

For famous Gardner-Denver versatility and interchangeability, get all the facts on this exciting new line of air tools. See your Gardner-Denver air tool specialist, or write for bulletins.

New 11B2 Series Inline Drill. New line also includes angle drills, ratchet wrenches, tappers.

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You are looking at the very newest in face-mounted wall fountains... exciting new designs dramatically created in stainless steel by Halsey Taylor. They're just some of the many fountains and coolers in the complete new Halsey Taylor line!

The Halsey W. Taylor Co.
Warren, Ohio

✦ in glamorous stainless steel

In addition to these, you can obtain recess and semi-recess wall types, coolers for all purposes, class-room fixtures and wall brackets...all in lustrous stainless steel.

And you also get all the extra Halsey Taylor features, such as dependable performance, health-safety, maintenance-free service.

Fountains illustrated:
Top View...13" back
Centre.....1¾" back
At right.....6" back

Write for latest catalog, or see Sweet's or the Yellow Pages

Halsey Taylor

THIS MARK OF LEADERSHIP IDENTIFIES THE MOST COMPLETE LINE OF MODERN DRINKING FIXTURES

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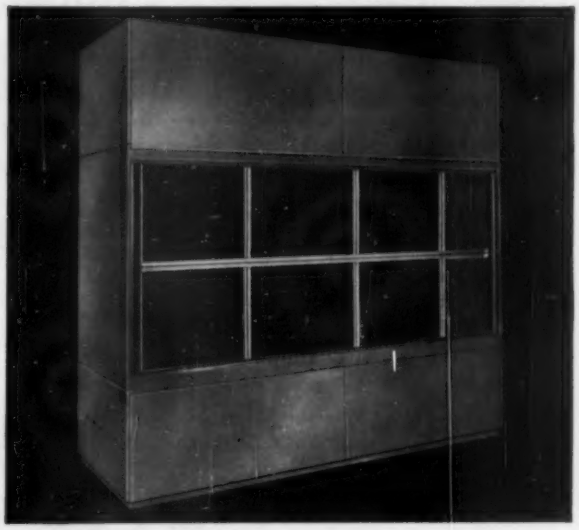
. . . require less floor space than any other comparable units!

Adding to its 25 and 30 ton models, Carrier now also offers Commercial Weathermakers* in 40 and 50 ton capacities for air conditioning stores, offices and industrial plants.

All four of these heavy-duty self-contained units provide all of the air conditioning functions—cooling, heating, dehumidifying, filtering and circulating—in one compact package. Installed as single units or in multiple applications, they offer the advantages of low first cost and low operating cost. They are designed especially for larger applications regardless of a building's age, shape or condition.

Other advantages! They are adaptable for a great number of applications. Why? Because they require less floor space per ton of capacity than any other comparable units and because of the flexibility of the fan section. Choice of fan arrangements simplifies duct design and permits installation where headroom is limited.

Your Carrier dealer will be glad to give you complete information about these new 40 and 50 ton Commercial Weathermakers. Whether you're considering air conditioning *or* heating —or air conditioning *and* heating—he offers a line of equipment second to none to meet your requirements most efficiently and economically. You'll find him listed in the Yellow Pages. Call him. Or write Carrier Air Conditioning Company, Syracuse 1, New York. **Reg. U.S. Pat. Off.*



Carrier Commercial Weathermakers—water or air cooled condensing

Carrier Air Conditioning Company

Cut building service costs to the bone!

Now you can centralize the control of plant protection and many other building services in one location!

Many of your critical building services can now be monitored and controlled from a centralized location. For example, one man can monitor boilers, start and stop motors and check liquid level controls. In addition, at the Honeywell Centralized Control Panel, he is instantly alerted to a security violation at any building or area through a number of electronic security devices such as the Sono-Sentry* below.

Centralized control minimizes the possibility of human error, frees guards and other employees for more productive work and virtually eliminates losses from fire, theft or vandalism. For further information, call your nearest Honeywell office. Or, send the coupon below. *Trademark

Central Control Panel. The Honeywell Central Control Panel is the heart or communication center for all your building services including security. The panel may be as simple or elaborate as desired.

Equipment/Surveillance Alarm. System detects and signals malfunctions for such typical applications as multiple-boiler power systems, supervising combustion, refrigeration, and compression.

Sono-Sentry Motion Detector. Sounds an alarm when unauthorized persons move into restricted area. May be used with local alarm or remote control panel. Key switch permits authorized persons to enter under controlled conditions.

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First in Control

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Gentlemen: Please rush information on the following:

☐ Central Control Panel ☐ Surveillance Alarm ☐ Sono-Sentry

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hand tool division
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Henry Kelly, Plant Manager, Taylor-Forge's Carnegie Works, says:

"Bitumastic Coatings give us a competitive edge in selling pre-coated, Spiral-Weld Pipe"

"In today's highly competitive pipe market, our new customer service of shop-coating spiral-weld pipe with Bitumastic coatings has helped to maintain our sales volume," Mr. Kelly reports. Taylor-Forge Spiral-Weld Pipe is used principally for water, oil and gas service and we have found Bitumastic coatings readily acceptable in all of these fields. This preference for Koppers corrosion-prevention coatings has led to an increase in sales of Bitumastic-coated pipe every month since the service began. Shop coating saves our customers money by eliminating the need for field coating —and protects the pipe in transit and storage, too."

Taylor-Forge applies Bitumastic Coatings at its Carnegie, Pennsylvania plant, protecting the pipe inside and outside with a Bitumastic coating system, according to the needs and specifications of each individual customer.

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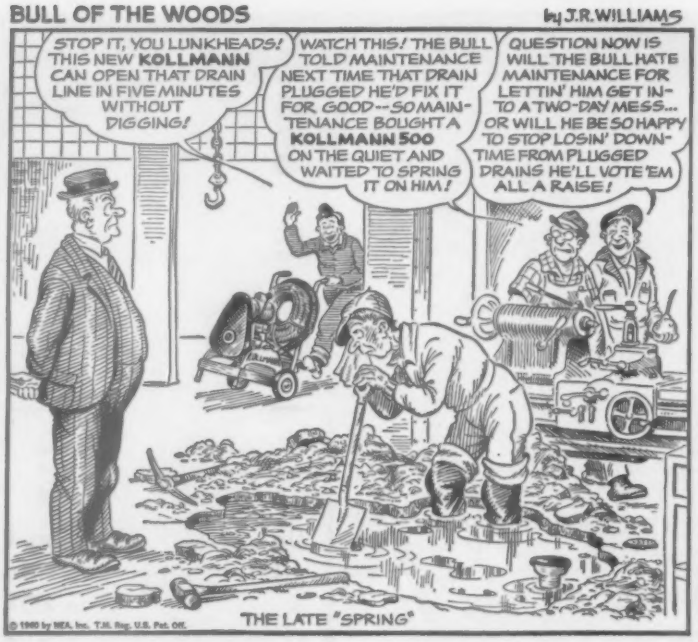
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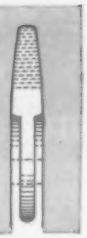
Only CRESTOGRIP has this double strength BOX JOINT. All others have conventional lap joint.



Grips Anything!

Flat, square, round or hex. objects. Adjustable to 4 positions up to 1½" capacity.

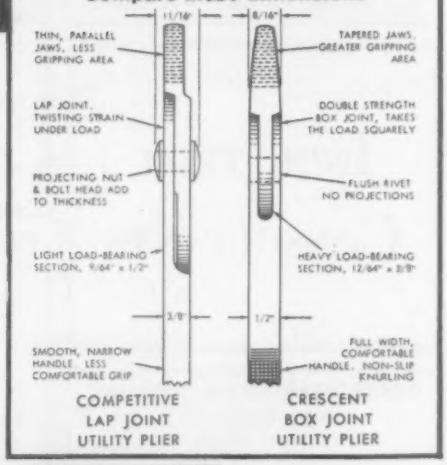
NO OTHER UTILITY PLIER LIKE CRESTOGRIP®

Easy to Adjust!

Simply "walk" the rivet recess over the bearing point (shown in cut-a-way view) with a pumping action of handles.

World's Thinnest!

Compare these dimensions

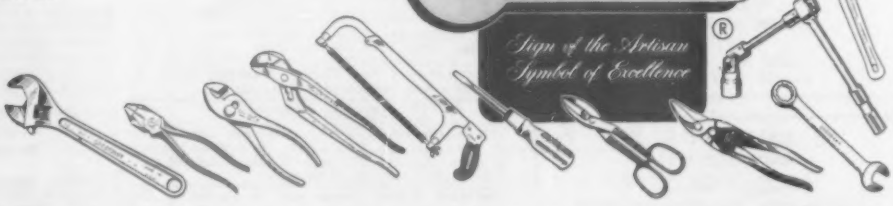

11/16"
THIN, PARALLEL JAWS, LESS GRIPPING AREA
LAP JOINT, TWISTING STRAIN UNDER LOAD
PROJECTING NUT & BOLT HEAD ADD TO THICKNESS
LIGHT LOAD-BEARING SECTION, 9/64" x 1/2"
3/8"
SMOOTH, NARROW HANDLE, LESS COMFORTABLE GRIP
COMPETITIVE LAP JOINT UTILITY PLIER
8/16"
TAPERED JAWS, GREATER GRIPPING AREA
DOUBLE STRENGTH BOX JOINT, TAKES THE LOAD SQUARELY
FLUSH RIVET NO PROJECTIONS
HEAVY LOAD-BEARING SECTION, 12/64" x 3/8"
1/2"
FULL WIDTH, COMFORTABLE HANDLE, NON-SLIP KNURLING
CRESCENT BOX JOINT UTILITY PLIER

Crescent's No. P210 CRESTOGRIP is a utility plier absolutely without equal. It's distinctive features, illustrated on this page tell why. Exhaustive tests against competitive tools prove CRESTOGRIP to be stronger, thinner in overall dimensions, and capable of greater gripping power.

This versatile tool measures 9½" overall, weighs a mere 12 ounces, yet gets in and grips where no other tool will do the job. Finished in rust resistant zinc plating. Retails for only $3.15.

New smaller size, No. P27, 7 inch, retails for only $2.50.

CRESCENT TOOLS
Give Wings to Work
Sign of the Artisan
Symbol of Excellence
®



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CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

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CLARAGE

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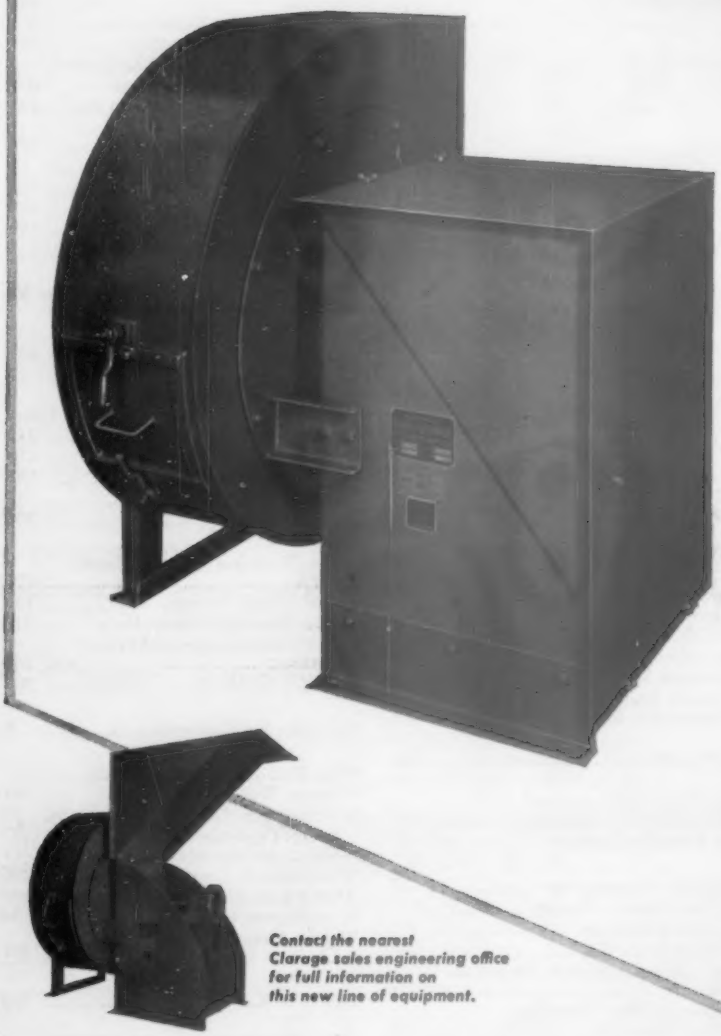
Packaged INDUSTRIAL FANS



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Hinged cover completely encloses motor, drive, and bearings for weatherproof installation outdoors or for added safety on indoor applications.

These compact, rugged, economical units are available with either the open type wheel for handling materials or the high efficiency backplate wheel for light dusts and fumes.

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Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

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NAME..... TITLE.....

Card Good Only Through October 1961

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CITY AND STATE

STREET.....

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PRODUCTION
1—Shop tools
2—Abrasive wheels
3—Turret drilling machines
4—Power presses
5—Lathes
6—Blister packaging
7—Plant equipment
8—Roller rebuilder
9—Hole measurement

VALVES, PIPES, FITTINGS
10—Valves, accessories
11—Cylinder pipe
12—Stainless steel valves
13—Unions, fittings
14—Ball valves
15—Stemi-steel valves
16—Unions

INSTRUMENTS AND CONTROLS
17—Speed-measuring systems
18—Semiconductor testing
19—Bronze meters
20—Dial indicators
21—Two-way mobile radio
22—Data processing
23—Dielectric testing

AUXILIARY
24—Compressors
25—Air conditioners
26—Infra-red burners
27—Centrifugal pumps
28—Tank heaters
29—Heat exchanger

MATERIAL HANDLING
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31—Cranes
32—Shipping containers
33—Belt conveyors
34—Packing scale
35—Sling chains
36—Marking devices
37—Storage equipment
38—Bucket elevators
39—Packaging

BUILDING
40—Metal buildings
41—Air diffusers
42—Acoustical ceiling systems
43—Built-up roofs

PLANT SITES
44—Nebraska
45—Nebraska
46—Michigan

MAINTENANCE
47—Concrete floor care
48—Sprinkler alarm systems
49—Boiler troubleshooters
50—Maintenance products
51—Floor care

ELECTRICAL
52—Switchgear
53—Range drives
54—Insulated cable
55—Rectifiers
56—Motors
57—Bus ducts
58—Torque motors
59—Electrification systems
60—Rectifiers
61—Ballasts

Square D TOTALLY ENCLOSED Duct*

takes less space—*and costs no more*

*(low impedance)

Ventilated bus duct is bulky and awkward. It's difficult—sometimes impossible—to install it in restricted areas. The layers of insulation around the bus bars and the necessary air spaces contribute to large, inconvenient size.

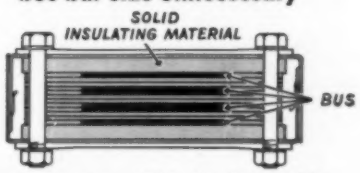
Square D totally enclosed feed-in duct solves the space problem. Solid sheets of insulation permit mounting bus bars only ¼" apart. This solid insulating material is also an effective heat conductor, thus eliminating the need for air spaces. The result—Square D low-impedance duct is as much as 50% smaller than ordinary duct. It can be used where no other duct fits. It makes expansion of existing electrical systems easier, new construction planning simpler. Best of all, Square D low-impedance bus duct is totally enclosed. Having no ventilation holes, it's safe from physical damage and dust accumulation. Needing no ventilation, it can be mounted in any position without de-rating.

Doesn't it make sense, when buying feed-in duct, to specify a product that will meet all your requirements? Square D totally enclosed low-impedance duct costs no more—why settle for less?

Here's Why Square D's

EXCLUSIVE Design

makes ventilation and increased bus bar size unnecessary



The entire space within the duct and between the bus bars is filled with a solid insulating material which conducts the heat to the surface. There are no dead air spaces inside the duct. Square D totally enclosed low-impedance duct meets U/L requirements for temperature rise with no larger bus bars (hence, no higher cost) than ventilated duct.

SQUARE D COMPANY

wherever electricity is distributed and controlled

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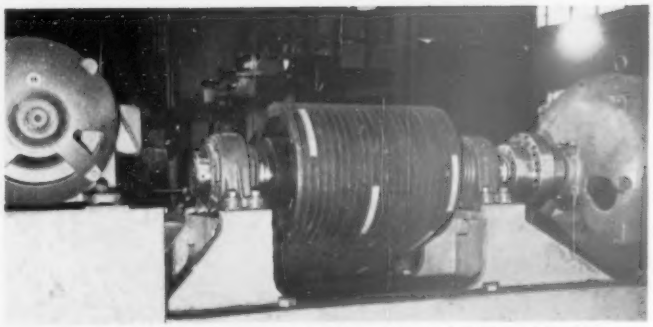
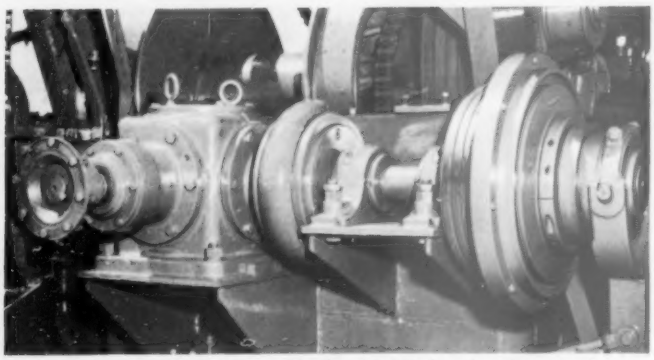
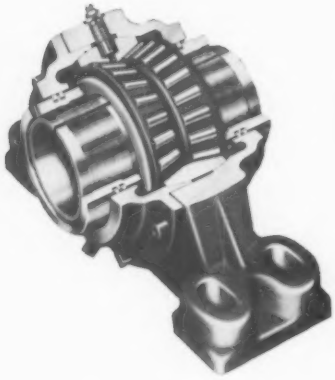


Timken bearing equipped Dodge All-Steel Pillow Blocks used on steel mill hot saw.



Dodge Type "E" Pillow Block with Timken bearings used on drive hookup of a rotary table.

Dodge 7" Special Duty Pillow Blocks with Timken bearings used on skip hoist bull wheel at a steel mill.



From steel mills to oil wells . . .

DODGE PILLOW BLOCKS WITH TIMKEN® BEARINGS BOOST LIFE, CUT MAINTENANCE

Pictured here are three of the wide range of applications where Timken® bearing equipped Dodge Pillow Blocks handle tough jobs with minimum attention. They last longer, cut maintenance because: 1) Timken bearings are tapered to take *any* combination of radial and thrust loads. 2) They have smaller radial running clearances than axial internal clearances, providing more effective sealing, holding shafts on center for extra precision. And, 3) Timken double-row bearings are designed to permit positive lubrication. New grease can be added directly to the center of the bearing and seal. It forces out old grease, lengthens bearing life, cuts maintenance.

The cutaway view shows Timken bearings in the Dodge All-Steel Pillow Block. The specially designed bearing has a tapered bore with self-aligning spherical outer surface—never needs adjustment.

Timken bearing equipped Dodge Pillow Blocks include the All-Steel, Special Duty, Type "C", Double-Interlock and Type "E"—cover every engineering need. And with Timken bearings, space consuming thrust devices are not needed. For your No. 1 bearing value, specify "Timken".

The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits. Canadian Division: Canadian Timken, St. Thomas, Ontario.

Industry rolls on

TIMKEN®

tapered roller bearings

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